REMEDIAL INVESTIGATION REPORT

for

LOWER DARBY CREEK AREA SITE, CLEARVIEW LANDFILL GROUNDWATER OPERABLE UNIT 3 (OU-3)

DARBY TOWNSHIP
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

VOLUME I
Text, Tables, and Figures

EPA Contract Number EP-S3-07-04
EPA Work Assignment Number 048-RICO-D366
Tetra Tech Project Number 03943

FEBRUARY 2019

TETRA TECH

PHIL-26502

REMEDIAL INVESTIGATION REPORT

for

LOWER DARBY CREEK AREA SITE, CLEARVIEW LANDFILL GROUNDWATER OPERABLE UNIT 3 (OU-3)

Darby Township, Philadelphia and Delaware Counties, Pennsylvania

EPA Contract Number EP-S3-07-04
EPA Work Assignment Number 048-RICO-D366
Tetra Tech Project Number 03943

Tetra Tech, Inc.
234 Mall Boulevard, Suite 260
King of Prussia, Pennsylvania 19406

FEBRUARY 2019

SUBMITTED BY:

JC KIM, PhD, P.E.
PROJECT MANAGER
TETRA TECH, INC.
NEWARK, DELAWARE

APPROVED BY:

NEIL TEAMERSON, PMP
PROGRAM MANAGER
TETRA TECH, INC.
KING OF PRUSSIA, PENNSYLVANIA

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

SECTION **PAGE**

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

FIGURES

TABLE OF CONTENTS (Continued)

FIGURES (Continued)

TABLES

TABLE OF CONTENTS (Continued)

TABLES (Continued)

TABLE OF CONTENTS (Continued)

TABLES (Continued)

TABLE OF CONTENTS (Continued)

TABLES (Continued)

ACRONYMS AND ABBREVIATIONS

°C	Degree Celsius
°F	Degree Fahrenheit
ADAF	Age Dependent Adjustment Factor
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	Acoustic Televiewer
BAP	Benzo(a)pyrene
BCF	Bioconcentration Factor
BERA	Baseline Ecological Risk Assessment
bgs	Below Ground Surface
BHC	Beta-Hexachlorocyclohexane
bls	Below Land Surface
BRA	Baseline Risk Assessment
BTAG	Biological Technical Assistance Group
BTEX	Benzene, Toluene, Ethyl Benzene, and Xylenes
C&D	Construction and Debris
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFD	Cubic Feet Per Day
CLP	Contract Laboratory Program
cm	Centimeter
cm/sec	Centimeter Per Second
COC	Contaminant of Concern
COPC	Chemical of Potential Concern
$C_{pw\ m}$	Maximum Chemical Concentration In Pore Water
CRQL	Contract Required Quantitation Limit
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
CTE	Central Tendency Exposure
DC	Direct Current
DCE	Cis-1,2-Dichloroethene
DCNR	(Pennsylvania) Department of Conservation and Natural Resources
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
Dhc	*Dehalococcoides*
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved Oxygen
DU	Decision Unit
EC	Electrical Conductivity
EEQ	Ecological Effects Quotient
EFS	Environmental Field Services, Inc.
Eh	Redox Potential
EPA	U.S. Environmental Protection Agency
EPC	Exposure Point Concentration

ACRONYMS AND ABBREVIATIONS

EPIC	Environmental Photographic Interpretation Center
EQ	Environmental Quality Company
ERA	Ecological Risk Assessment
ERT	(EPA) Environmental Response Team
ET	Evapotranspiration
EU	Exposure Unit
FDEM	Frequency-Domain Electromagnetic
FID	Flame Ionization Detector
FLIR	Forward-Looking Infrared
f_{oc}	Fraction of Organic Carbon
ft/day	Feet Per Day
ft/ft	Foot Per Feet
GC/MS	Gas Chromatography/Mass Spectrometry
GFAA	Graphite Furnace Atomic Absorption
GPS	Global Positioning System
GRM	Graves Resource Management
GRO/DRO	Gasoline-Range Organics/Diesel-Range Organics
GW	Groundwater
HA	Health Advisory
HEAST	Health Effects Assessment Summary Table
HCN	Hydrogen Cyanide
HHRA	Human Health Risk Assessment
HI	Hazard Index
HPT	Hydraulic Profiling Tool
HQ	Hazard Quotient
HRS	Hazard Ranking System
IC	Institutional Control
ICIAP	Institutional Control Implementation and Assurance Plan
ID	Inside Diameter
IDW	Investigation-Derived Waste
IEUBK	Integrated Exposure Uptake Biokinetic Model
ILCR	Incremental Lifetime Cancer Risk
IR	Infrared
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
K	Hydraulic Conductivity
k	First-Order Degradation Rate Constant
K_d	Soil-water Distribution Coefficient
K_{oc}	Organic Carbon Partition Coefficient
K_{ow}	Octanol/Water Partition Coefficient
LDCA	Lower Darby Creek Area
LOAEL	Lowest Observed Adverse Effect Level
MCL	Maximum Contaminant Level

ACRONYMS AND ABBREVIATIONS

mg/kg	Milligram Per Kilogram
mg/L	Milligram Per Liter
ml	Milliliter
MI	Mobility Index
MIP	Membrane Interface Probe
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSC	Medium-Specific Concentration
msl	Mean Sea Level
MSW	Municipal Solid Waste
mV	Millivolt
MW	Monitoring Well
NAPL	Nonaqueous-Phase Liquid
NCEA	National Center for Environmental Assessment
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observed Adverse Effect Level
NOV	Notice of Violation
NPL	National Priorities List
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
OCDD	Octachlorodibenzo-p-dioxin
ORP	Oxidation-Reduction Potential
OSRTI	Office of Superfund Remediation and Technology Innovation
OU	Operable Unit
PADEP	Pennsylvania Department of Environmental Protection
PADER	Pennsylvania Department of Environmental Resources
PAH	Polycyclic Aromatic Hydrocarbon
PASWMA	Pennsylvania Solid Waste Management Act
PCB	Polychlorinated Biphenyl
PCDD	Polychlorinated Dibenzo-dioxins
PCDF	Polychlorinated Dibenzofurans
PCE	Tetrachloroethene
PCP	Pentachlorophenol
PDI	Pre-Design Investigation
PFAS	Per- and Polyfluoroalkyl Substances
PFBC	Pennsylvania Fish and Boat Commission
PFC	Perfluorinated Compound
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
PGC	Pennsylvania Game Commission
pg/L	Picogram Per Liter
PID	Photoionization Detector
PLS	Professional Licensed Surveyor

ACRONYMS AND ABBREVIATIONS

PNDI	Pennsylvania National Diversity Inventory
PPR	Philadelphia Parks and Recreation
PPRTV	Provisional Peer Reviewed Toxicity Value
PRA	Philadelphia Redevelopment Authority
PRP	Potentially Responsible Party
PSL	Project Screening Level
PVC	Polyvinyl Chloride
PW	Pore Water
QA/QC	Quality Assurance/Quality Control
RAGS	Risk Assessment Guidance for Superfund
RDase	Reductive Dehalogenase
RfC	Reference Concentration
RfD	Reference Dose
RI/FS	Remedial Investigation/Feasibility Study
RL	Reporting Limit
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RSL	Regional Screening Level
S	Water Solubility
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SI	Site Inspection
SIA	Southern Industrial Area
SIM	Selective Ion Monitoring
SLERA	Screening Level Ecological Risk Assessment
SOP	Standard Operating Procedure
SOW	Scope of Work
SPE	Solid Phase Extraction
SU	Standard Units
SVOC	Semivolatile Organic Compound
SWSL	Surface Water Screening Level
$t_{1/2}$	Half-life
TAL	Target Analyte List
TCDD	Tetrachlorodibenzo-p-dioxin
TCE	Trichloroethene
TCL	Target Compound List
TCRA	Time-Critical Removal Action
TEF	Toxicity Equivalency Factor
TEL	Tetraethyl Lead
TEQ	Toxicity Equivalent
TMDL	Total Maximum Daily Load
TML	Tetramethyl Lead

ACRONYMS AND ABBREVIATIONS

UCL	Upper Confidence Limit
µg/dL	Microgram Per Deciliter
µg/L	Microgram Per Liter
µS/cm	MicroSiemen Per Centimeter
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USDOI	U.S. Department of Interior
USGS	U.S. Geological Survey
VC	Vinyl Chloride
VDEQ	Virginia Department of Environmental Quality
VI	Vapor Intrusion
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound
VP	Vapor Pressure
VPN	Virtual Private Network
WHO	World Health Organization
WP	Work Plan
WQC	Water Quality Criteria
WQS	Water Quality Standards

EXECUTIVE SUMMARY

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) tasked Tetra Tech to perform a Remedial Investigation (RI) for groundwater at the Lower Darby Creek Area (LDCA) site located in Philadelphia and Delaware Counties, Pennsylvania. The LDCA site was placed on the final National Priorities List (NPL) in June 2001 due to its potential release of hazardous substances to the nearby surface water, possibly posing a threat to human health, ecological receptors, and other sensitive environments.

The LDCA site consists of two separate landfills and is divided into three operable units by EPA as follows:

- Operable Unit 1 (OU-1): Clearview Landfill
- Operable Unit 2 (OU-2): Folcroft Landfill and Annex
- Operable Unit 3 (OU-3): Clearview Landfill - Groundwater

EPA is the lead agency conducting RI activities for the Clearview Landfill (OU-1 and OU-3), and a group of potentially responsible parties (PRPs) are responsible for performing RI activities for the Folcroft Landfill and Annex (OU-2). The OU-1 RI was completed in May 2011, and a Record of Decision (ROD) for OU-1 was signed in September 2014. The primary component of the selected remedy for OU-1 is an evapotranspiration cover. The remedial action for OU-1 will address landfill waste, contaminated soils, leachate seeps, and landfill gas associated with the landfill.

The general objectives of the OU-3 RI were to characterize site conditions, determine the nature and extent of contamination, and assess risks to human health and the environment posed by site groundwater. This report was prepared to present information pertaining to groundwater associated with the landfill and its impact to nearby aquifers, herein referred to as the "site." Findings from the OU-3 RI will be used as a basis to develop, screen, and evaluate remedial alternatives to address any unacceptable risks posed by groundwater.

SITE CHARACTERISTICS

The LDCA site is located in an industrial section of Darby Township, Delaware and Philadelphia Counties in Pennsylvania. The landfill is bordered by the eastern banks of Darby and Cobbs Creeks, 83rd Street, and Buist Avenue. The landfill footprint currently resides partly in Delaware County and Philadelphia County, and includes the Clearview Landfill, the Eastwick Recreational Park (a.k.a., City Park) east of the landfill, and the Eastwick neighborhood. The EPA EJView 2010 census data show 3,666 people live immediately adjacent to the landfill, and 1,507 homes lie within a 0.5-mile radius of the landfill.

In general, land use near the LDCA site is urban residential mixed with commercial, industrial, and natural area uses. According to the EPA 1983 study of Clearview Landfill, land uses of the site are commercial/light industrial; vacant urban lands; and dump, although the entire land has been used for dumping waste. Land use adjacent to and east of the landfill is predominantly residential. All residential properties in the Eastwick neighborhood are located within the City of Philadelphia boundary, while the landfill is entirely located in Delaware County.

The landfill was privately owned and operated without a permit from the 1950s to the 1970s by the Clearview Land Development Corporation, and used for the disposal of municipal and industrial waste collected from the City of Philadelphia and portions of Delaware County. No documentation for installation of an engineered cover or functioning run-on/runoff control system at the landfill exists. In August 1973, due to the absence of a landfill permit and several violations of state land-disposal regulations, the Pennsylvania Department of Environmental Protection (PADEP) took court action against the Clearview Land Development Corporation, ordered it to cease all waste disposal activities at the landfill, and directed it to follow a prescribed closure plan. However, even after this order, the property continued to be used for other waste disposal operations for many years.

When the landfill was closed in 1973, aerial photographs showed it had expanded to the east and covered about 65 acres. The wetland areas formerly located east of the landfill were filled. Pools of standing liquid and pits containing liquid (the constituents of the liquid were not determined) were observed on the landfill surface. Tank cars (tanks) and dark stains were also noted on the landfill, indicating liquid wastes may have been brought to the landfill. Aerial photographs also indicated new residential properties were constructed east and southeast of the landfill, possibly on top of a former filled area.

Currently, the south end of the landfill (referred to as the Southern Industrial Area) is used by several businesses, including an auto repair operation, a trash hauling business, and an area for paving material storage, equipment storage, and salvage operations. Additional ad-hoc businesses also exist on-site. Local residents access the landfill area for walking, all-terrain vehicle riding, deer hunting, and other activities.

All known residents in the Delaware and Philadelphia Counties are supplied with potable water by a public water supplier. No drinking water wells are known to exist on the Pennsylvania side of the Delaware River. However, drinking water wells for Gibbstown and the Borough of Paulsboro (approximately 5.5 and 4 miles south of the landfill, respectively) are located on the New Jersey side of the Delaware River.

Surface water features associated with the site consist of creeks and marsh areas, including Darby, Cobbs, and Hermesprota Creeks. The main stem of Darby Creek originates in Easttown Township, Chester County, and is joined by a number of tributaries as it flows downstream. Cobbs Creek, the major tributary of Darby Creek, converges with Darby Creek north of the landfill. Darby Creek is then joined by Hermesprota Creek near the marsh area in John Heinz National Wildlife Refuge (NWR) at Tinicum. Water from Darby Creek and the marsh ultimately flows into the Delaware River. The confluence of Darby Creek and the Delaware River is approximately 3.5 miles downstream of the landfill. An impoundment and tidal wetlands exist within the John Heinz NWR.

Tidal influence affects the lower portion of Darby Creek and upstream as far as the landfill. Tidal influence generally affects Darby Creek up to the confluence of Darby and Cobb Creeks near the northern portion of the landfill, but the extent of tidal influence changes depending on climate conditions. Flood plains encroach significantly onto the study area. Hurricane Floyd in 1999 caused significant flooding of Cobbs and Darby Creeks into the Eastwick neighborhood and surrounding area, inundating many homes. Flooding appears to commonly occur in the area.

Clearview Landfill is on unconsolidated coastal plain sediment (Quaternary Trenton Gravel at the surface) overlying bedrock of the Wissahickon Formation. Depth to bedrock was encountered from approximately 18 feet below ground surface (bgs) in the Eastwick neighborhood to as deep as approximately 44 feet bgs in the Southern Industrial Area of the landfill.

From the surface layer downward, the landfill has fill soil, concrete, and construction debris up to a depth of approximately 20 feet bgs; landfill wastes up to 75 feet thick at the center of the landfill; a discontinuous peat layer (an organic-rich marsh deposit) approximately 1-3 feet thick; layers of sand, gravel, silt, and clays (similar in description to natural Trenton Gravel deposits) about 10-15 feet-thick; and Wissahickon Formation rock, consisting of micaceous schist.

Ground surface geology in City Park is generally comprised of fill soil from up to two-feet thick, but in some areas, particularly the northern open field of City Park, the surface is covered by only a thin layer of fill, and wastes visibly protrude at ground surface. Landfill wastes are 8-12 feet thick in the former marshland below the City Park area. Beneath the surface layers, a discontinuous natural organic peat layer (an organic-rich marsh deposit) with a thickness of 1-3 feet, and discontinuous sand, silt, and clay about 10-15 feet thick lie above bedrock and the Wissahickon Formation rock, the latter consisting primarily of oligoclase-mica schist.

The Eastwick neighborhood was constructed on top of re-worked fill soil and demolition debris about 1-2 feet thick. The re-worked soil and debris are thicker in some isolated places. Demolition debris appeared to consist of demolished structures that were formerly located there in the mid-1970s. A

15-25-foot layer of discontinuous sand, silts, and clay lies above bedrock and Wissahickon Formation rock containing micaceous schist.

Regional groundwater flow is expected to be toward the southwest and the Delaware River. Local groundwater flows toward nearby surface water bodies (Darby, Cobbs, and Hermesprota Creeks). A groundwater mound (or high water table) under the landfill produces radial groundwater flow away from the landfill toward Darby and Cobbs Creeks; flow south below the Southern Industrial Area, and east below the Eastwick neighborhood. Groundwater flow in the bedrock aquifers is easterly. Groundwater gradients are typically low in this type of aquifer (e.g., the hydraulic gradient of about 10 feet per mile or less).

Groundwater recharge occurs throughout the landfill area. Little or no runoff from the landfill is apparent during smaller storm events. Water level and groundwater flow data indicated groundwater recharge occurs primarily in enclosed drainage basins (on the eastern side of the landfill) that do not drain into Darby and Cobbs Creeks. Groundwater and/or leachate visibly discharges at seeps in the banks of the Darby and Cobbs Creeks north, west, and southwest of the landfill. Gas bubbles were observed during the OU-1 RI in the base of the Darby and Cobbs Creeks, suggesting groundwater/leachate seeps into the creek bed with actively decaying organic matter.

The City Park and part of Eastwick neighborhood were originally a wetlands/marsh area. Clearview Landfill was a regional groundwater discharge area, and regional groundwater flows southeastward, but locally toward Darby and Cobbs Creeks.

Water table elevations in shallow wells appear to be higher than elevations measured in deeper wells. Therefore, it is likely hydraulically separate zones exist above/below discontinuous silt/clay layers at the site. Groundwater below these layers is semi-confined, and is not directly connected to the water-table aquifer. However, fewer silt/clay confining layers exist below the water table north and east of the landfill, and semi-confined conditions may not be present there.

RI FIELD ACTIVITIES

Field activities for the OU-3 RI were conducted to collect data of sufficient quantity and quality to fully define the nature and extent of groundwater contamination at the site, to define its impact to nearby creeks and aquifers, and to fill any remaining data gaps before selecting the remedy.

Initial site reconnaissance was performed in June 2012. Field activities included assessing well conditions, creek conditions, site accessibility, and tidal influence. Additional site reconnaissance was performed in

February/March 2013 to evaluate potential sampling techniques and the effectiveness and implementability of real-time sensing tools.

The creek investigation was performed to assess whether contaminated groundwater (mixed with leachate) was discharging from the landfill to the creeks, and to determine approximate discharge locations. The U.S. Geological Survey (USGS) performed remote-sensing of water conductivity and temperature using a radio-controlled boat equipped with a conductivity sensor and an infrared thermometer in March 2013. USGS also performed a surficial geophysical survey in March 2013, and a specific conductance survey for pore water during low tide conditions in July and August 2013.

Pore water was initially sampled at 12 stations along the creek bank above the waterline in May 2013. Additional pore water sampling was conducted along six transects extending from the creek bank in September 2013; each transect contained two to three sampling stations across the creek. Additional pore water samples collected from nine selected sampling stations in February 2016 were analyzed for dissolved and total metals only.

During the shallow aquifer investigation conducted from April to October 2013, 175 temporary boreholes were advanced, and 194 groundwater samples were collected to delineate the groundwater plume. Seven borings were drilled into the saprolite and bedrock during the deep aquifer assessment conducted from July through October 2013.

Thirty-seven new monitoring wells were installed for the OU-3 RI in February and March 2014 based on sampling results from temporary shallow and deep borings. Field activities included well drilling, construction, and well development, after which four rounds of groundwater sampling were conducted using 65 wells (37 new wells plus 28 existing wells).

NATURE AND EXTENT OF CONTAMINATION

Analytical results from four rounds of groundwater sampling indicated groundwater quality has been impacted by organic and inorganic contaminants originating from wastes in the landfill, from other sources not directly related to the landfill, as well as from potential sources and wastes not necessarily attributable to the site. Contaminated groundwater exists below the landfill, and in the coastal plain aquifer and the bedrock aquifer outside the historic landfill boundary. Landfill-related pollutants detected in groundwater included inorganics, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), dioxins/furans, and perfluorinated compounds (PFCs). Most concentrations exceeded EPA regional screening levels (RSLs). In general, groundwater samples collected from landfill area contained contaminants at higher concentrations than those from outside the landfill boundary. Fewer contaminants were detected at lower concentrations in the deep groundwater outside the landfill boundary. Arsenic, 1,4-dioxane, and PFCs were the most pervasive contaminants detected in the study area. 1,4-Dioxane is very mobile and was often present at the leading edge of the shallow and deep plumes. A solvent plume [e.g., trichloroethene (TCE)] was also detected south of the historic landfill boundary.

Landfill Area Groundwater Samples: Many inorganics were detected at elevated concentrations in groundwater within the landfill area. Both total and dissolved metals were detected at concentrations exceeding their respective RSLs. Both total and dissolved arsenic concentrations were greater or equal to its federal maximum contaminant level (MCL) of 10 micrograms per liter (µg/L) in eight shallow wells, and were generally found only in wells within the landfill boundary. Only one deep well contained arsenic at 10 µg/L.

VOCs were detected at concentrations exceeding their respective RSLs in most groundwater samples; however, all detected concentrations were less than their respective MCLs. The primary SVOCs detected in exceedance of RSLs were polycyclic aromatic hydrocarbons (PAHs) and 1,4-dioxane.

Eight pesticides (4,4'-DDD, 4,4'-DDE, aldrin, beta-BHC, dieldrin, gamma-BHC, heptachlor, and heptachlor epoxide) were detected at high concentrations exceeding their respective RSLs in 12 shallow wells within the landfill boundary. Pesticides were not found in deeper wells at levels above RSLs.

PCBs were frequently detected in groundwater samples collected within the landfill area, with total PCB congeners in some samples detected at concentrations exceeding its RSL [44,000 picograms per milliliter (pg/L]).

Total toxicity equivalency (TEQ) concentrations for dioxins and furans in groundwater samples exceeded the RSL (0.12 pg/L) for 2,3,7,8-tetrachlorodibenzodioxin (TCDD). Of these samples, only the sample MW-11 contained TCDD exceeding its MCL (30 pg/L).

Perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) were detected frequently at high concentrations above their screening values. The combined concentrations of PFOA and PFOS exceeded the current EPA health advisory (HA) level (0.07 µg/L) throughout most of the landfill area.

Outside Landfill Boundary Shallow (Overburden) Groundwater Samples: Similar contaminants (as described above for the landfill area) were detected in shallow groundwater outside the landfill boundary, including inorganics, VOCs, SVOCs, pesticides, PCBs, dioxins/furans, and PFCs. However, although detected concentrations still exceeded screening criteria, concentrations were generally lower, as was the frequency of detections. Relatively high concentrations of contaminants were detected in wells located in the Eastwick neighborhood close to the eastern boundary of landfill and south of the landfill.

Many inorganics were detected at high concentrations exceeding RSLs, including 10 metals that were detected at concentrations exceeding their respective RSLs in both total and dissolved forms. Total and/or dissolved arsenic concentrations greater than its MCL were detected in seven shallow wells, and total antimony and lead were detected at concentrations exceeding their respective MCLs in three wells.

VOCs were not detected as commonly as metals, and were detected at relatively low concentrations. Benzene, TCE, and vinyl chloride (VC) were all found above screening levels in well MW-25 located south of the landfill. Benzene was detected above its MCL in one well only, while TCE and VC were found above their MCLs in two wells each. TCE was also detected above its RSL (0.28 µg/L) in five other wells. Contaminant levels detected in MW-25 may not be attributable to the landfill, given its location and potential for other suspected sources of contamination to exist near this well.

1,4-Dioxane was detected in most wells above its RSL, with the highest concentration detected at MW-41D, close to the east boundary of landfill. The 1,4-dioxane plume originating at the landfill may represent the maximum extent of groundwater impacts associated with OU-3; however, whether this entire pattern of contamination outside the landfill boundary can be attributable to the site is uncertain. Concentrations of 1,4-dioxane in shallow groundwater appeared to decrease east of the landfill before increasing at wells farther east. The primary SVOCs detected in exceedance of RSLs included benzo(a)anthracene, benzo(a)pyrene, naphthalene, and pentachlorophenol (PCP), primarily at wells MW-16S, MW-28, MW-25, and MW-41S. All detected concentrations were below their respective MCLs.

Five pesticides (aldrin, beta-BHC, dieldrin, heptachlor, and heptachlor epoxide) were detected at low concentrations exceeding their respective RSLs in 13 wells. Total PCB congeners detected in two wells exceeded the RSL, but TEQ was less than its RSL.

Total dioxin and furan TEQ concentrations from seven wells exceeded the RSL for TCDD, but were less than its MCL. PFOA was detected in 19 samples above its screening value, while PFOS was reported for 12 samples above its screening value during Round 2 sampling. Combined PFOA and PFOS concentrations above the RSL were detected in five wells located within the Eastwick neighborhood and close to the boundary of landfill.

Outside Landfill Boundary Deep (Bedrock) Groundwater: Inorganics, VOCs, SVOCs, pesticide, dioxins/furans, and PFCs were reported for samples collected from deep groundwater outside the landfill boundary. In general, fewer contaminants were detected, and at lower concentrations, in deep groundwater, with the exception of VOCs.

Many inorganics were detected at concentrations exceeding RSL screening values in deep groundwater outside the landfill boundary. Eight metals were detected at concentrations exceeding their respective RSL screening values in both filtered and unfiltered groundwater samples. Total arsenic was detected above its MCL in one well, but no other metal exceeded its MCL.

A solvent plume consisting of TCE, cis-1,2-dichloroethene (DCE), and VC existed south of the landfill. TCE was reported for wells MW-13D, MW-13I, and MW-19 ranging from 5.9 to 420 µg/L. TCE, DCE, and VC were all detected above their respective RSLs in three wells each. Benzene was also found above its RSL in one well.

1,4-Dioxane was detected above its RSL in five wells. Benzo(a)pyrene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, and naphthalene were detected above their respective RSLs in three wells.

Dieldrin was the only pesticide detected above its RSL during the third round of groundwater sampling; this exceedance only occurred in one well. Total dioxin and furan TEQ concentrations exceeding the TCDD RSL were contained in five wells, but all concentrations were less than the MCL.

PFOA was detected at low concentrations above its screening value in three wells, but PFOS was detected above its screening value in only one well. The combined concentrations of PFOA and PFOS were reported above the EPA health advisory level in two wells only.

Groundwater Evaluation Summary: With respect to inorganics detected in groundwater, most elevated metal concentrations were detected near the center of the landfill, particularly for landfill wells MW-01S, MW-01D, MW-9, MW-10, and MW-11. Well MW-11 consistently contained the highest levels of many metals. Several wells adjacent to the eastern landfill boundary and within the Eastwick neighborhood also contained elevated metal levels. However, these concentrations significantly decreased at increasing distance from the landfill in all directions, for both shallow and deep aquifers. This was best reflected by the pattern of arsenic contamination, but was also true for other metals likely attributable to the site.

Compared to other classes of contaminants, most metals (especially heavier metals such as antimony, lead, mercury, and thallium) generally did not migrate very far from the landfill or from locations where they were placed as wastes. Metal concentrations detected in groundwater may be related to the quantity or volume of wastes containing each metal as disposed at the landfill, the physical state of the wastes, the concentration of that metal as deposited, and the depth to which it was placed. Metal-containing wastes placed directly into the water table may have affected groundwater quality to a greater extent than other wastes.

The pattern of PAH, PCB, and dioxins/furan contamination in groundwater was not as extensive as other classes of contaminants. While there were a few detections greater than RSLs, MCLs, or both, they were generally detected within the landfill boundary or just outside it. These compounds are larger molecules, do not readily leach to groundwater, and are less likely to migrate compared to other contaminants.

With respect to 1,4-dioxane, the likely sources of contamination appeared to be the center of the landfill and the Southern Industrial Area. The ability of 1,4-dioxane to migrate rapidly was reflected in the pattern of the shallow plume south and east of the landfill, as the deeper plume appeared smaller than the shallower plume.

Pore Water Evaluation: Pore water sampling results indicated the principal classes of contaminants in pore water were inorganics, PAHs, pesticides, and PCBs. Many inorganic and organic chemicals in the pore water samples were detected at concentrations that exceeded their respective EPA freshwater screening benchmarks.

Metal exceedances were detected in all pore water sample locations. In general, concentrations were greater in samples collected from the eastern side of Darby Creek as compared to concentrations from the western side.

High concentrations of PAHs were detected above their respective BTAG freshwater screening levels. The two PAHs with the greatest number of exceedances were anthracene and pyrene. PAH levels found in pore water samples may not be entirely related to groundwater discharges to streams, but rather to sediment absorption of PAHs attributable to upstream sources. Low concentrations of pesticides were detected above their respective freshwater screening levels at several sampling stations along the creek. Total PCB concentrations above its screening benchmark of were also detected at several sampling stations. All these sample locations were located at the eastern side of the creek. The only dioxin detected in pore water samples was octachlorodibenzodioxin (OCDD). The total TEQ concentration for fish was above its BTAG screening benchmark in two samples.

Pore water data were used to evaluate current site-related impacts to creek surface water; direct exposures to pore water were assessed to conservatively evaluate landfill groundwater impacts to surface water. Constituent concentrations of metals, boron, PAHs, 1,4-dioxane, PCBs, and dioxin reported in pore water were moderately correlated with those reported in groundwater from nearby wells along Darby and Cobbs Creeks. Therefore, it was likely chemicals in landfill groundwater have transported to creek pore water and surface water via groundwater seepage into creek. Surface water concentrations were expected to be much lower than in pore water because of mixing and dilution.

The deeper pore water samples at the same station often contained the highest concentrations of the contaminants classes evaluated. This conclusion was supported by reviewing most of the total metal results (except for iron and manganese), SVOCs (including 1,4-dioxane), several pesticides, total PCBs, and OCDD. Increasing contaminant levels were found at depth beneath Darby Creek, and may be attributable to shallow groundwater discharges near the creek, overland or subsurface leachate flows; contaminant absorption by sediments directly impacted by the site or by upstream sources of contamination; or a combination of these processes. Increasing concentrations at most locations may also be related to the presence of landfill wastes nearby, and the steepness of the hydraulic gradient. The deeper pore water samples were perhaps less likely to be affected by surface water flow and stream scour.

Three groups of pore water sampling locations and adjacent shallow groundwater wells were evaluated to determine the relationship between landfill groundwater and stream pore water. These paired groups included Cobbs Creek near the northern part of the landfill; Darby Creek adjacent to the middle of the landfill; and Darby Creek near the southern part of the landfill. Compared to groundwater sampling results, pore water concentrations generally correlated with the results reported for wells along the creeks, especially with regard to inorganics, boron, PAHs, 1,4-dioxane, PCBs, and dioxins. This evaluation concluded substances in landfill groundwater (likely comingled with leachate) would transport or migrate to stream pore water and adjacent surface water bodies through seepage. However, concentrations in surface water would be expected to be lower than pore water due to mixing, dilution, volatilization, and other physical processes (e.g., attenuation, dispersion, and degradation).

Based on the creek assessment (including pore water conductance results), observations of seeps along stream banks, pore water concentrations greater than freshwater screening benchmarks, and shallow groundwater concentrations greater than RSLs, four possible stream segments of concern were identified along Darby Creek. Segment “A” was located downslope from the highest elevations of the landfill and the mound in its center, while Segments “B” and “C” were downslope near the Southern Industrial Area. Segment “D” was farther downstream and adjacent to other potential sources of contamination. Contaminants most commonly associated with these four segments were arsenic, iron, manganese, and benzo(a)anthracene.

HUMAN HEALTH RISK ASSESSMENT

A human health risk assessment (HHRA) was conducted for groundwater beneath Clearview Landfill, shallow groundwater outside of the landfill, deep groundwater outside of the landfill; and creek pore water.

Potential human exposure routes assessed included potable groundwater use by future residents; direct contact with groundwater in excavations by construction workers; contact with pore water by recreational persons and construction workers; inhalation of outdoor vapors emitted from groundwater in open excavations by construction workers and industrial workers; inhalation of outdoor vapors during irrigation by industrial workers, and inhalation of indoor air impacted by vapor intrusion into industrial buildings.

EPA defines acceptable total cancer risks from all carcinogens as within the range of 10^{-6} and 10^{-4} excess lifetime cancer risk. For non-carcinogens, the benchmark level for acceptable risk is a hazard index (HI) of less than or equal to 1, which represents the sum of the hazard quotients (HQs) for all compounds affecting the same target organ. For lead, the benchmark level for acceptable risk is a blood lead concentration of 10 micrograms/deciliter (µg/dL) that is predicted to be exceeded in no greater than 5% of an exposed population. Most uncertainties identified for the HHRA may result from potential overestimation or underestimation of risk, for both the reasonable maximum exposure (RME) and central tendency exposure (CTE) scenarios. For example, overestimation of site-related risks could result from conservative assumptions for receptor exposure frequencies and lifetime exposure duration, use of 95% upper confidence limits on the mean as the exposure point concentration, and various 10-fold to 1000-fold uncertainty factor multipliers for toxicity values. These uncertainties are addressed in HHRA and should be considered as part of any risk management decisions about the site.

Results for each exposure scenario quantitatively addressed in HHRA are summarized below, and includes potential receptors exposed to media of concern within the area of interest, and the contaminants of concern (COCs) contributing to risk.

Landfill Area Groundwater: Exposure to groundwater under the RME scenario was associated with estimated cumulative cancer risks that exceeded the acceptable risk range for lifetime residents ($1x10^{-2}$) and industrial workers ($4x10^{-3}$). The estimated cumulative cancer risk for the construction workers ($1x10^{-4}$) was equal to the upper bound of EPA's target risk range. For the lifetime resident, COCs associated with cancer risk include TCDD TEQs, chromium, dioxin-like PCBs, nondioxin-like PCBs, arsenic, TCE, benzene, benzo(a)pyrene, 1,4-dioxane, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, aldrin, dieldrin, benzo(a)anthracene, delta-BHC, pentachlorophenol, bis(2-ethylhexyl)phthalate, beta-BHC, and heptachlor. For the industrial worker, the cancer risks were associated with TCDD TEQs, dioxin-like PCBs, nondioxin-like PCBs, 1,4-dioxane, naphthalene, aldrin, dieldrin, arsenic, and chromium.

The maximum of the estimated target organ HIs exceeded 1, for the child resident (HI=205), adult resident (HI=141), construction worker, (HI=62), and industrial worker (HI=65). COCs exhibiting HQs greater than 1 for residents include TCDD TEQs, dioxin-like PCBs, antimony, arsenic, cadmium, chromium, cobalt, cyanide, iron, manganese, mercury, and thallium. Additional COCs contributing to target organ-specific

HIs exceeding 1, but individually were associated with HQ contributions of less than 1, including zinc, aluminum, TCE, PFOA, PFOS, boron, beryllium, copper, silver, vanadium, 1,4-dioxane, barium, and chromium. COCs exhibiting HQs greater than 1 for construction workers and industrial workers include cyanide and TCDD TEQs. Additional COCs contributing to target organ-specific HIs that exceeded 1, but individually were associated with HQ contributions of less than 1, included TCE and dioxin-like PCBs.

As stated earlier, a predicted blood lead level above 10 µg/dL in less than 5% of the receptor population is considered protective. Blood lead concentrations were predicted to exceed 10 µg/dL in 82% of an exposed population of child residents. Blood lead predictions were not generated for construction workers or industrial workers because the adult lead model is not calibrated for groundwater exposure.

Outside Landfill Boundary Shallow Groundwater: Exposure to shallow groundwater outside the landfill under the RME scenario was associated with estimated cumulative cancer risks exceeding the acceptable risk range for lifetime residents ($1x10^{-3}$), but not for construction workers ($4x10^{-6}$). The estimated cumulative cancer risk for the industrial workers ($1x10^{-4}$) was equal to the upper bound of EPA's target risk range. Cancer risk COCs for residents included arsenic, VC, 2,6-dinitrotoluene, chromium, 1,4-dioxane, benzo(a)pyrene, 1,2-dibromo-3-chloropropane, bis(2-chloroethyl)ether, pentachlorophenol, dieldrin, TCDD TEQs, TCE, benzene, dioxin-like PCBs, 1,2-dichloroethane, and naphthalene.

The maximum of the estimated target organ HIs exceeded 1 for the child resident (HI=25), adult resident (HI=16), construction worker, (HI=9), and industrial worker (HI=9). COCs exhibiting HQs greater than 1 for residential receptors included 2,6-dinitrotoluene, PFOA, arsenic, cobalt, iron, manganese, thallium, and cyanide. Additional COCs contributing to target organ-specific HIs exceeding 1, but were individually associated with HQ contributions of less than 1, included aluminum, DCE, TCE, PFOS, TCDD TEQs, boron, cadmium, and silver. Cyanide was the only COC exhibiting an HQ greater than 1 for construction workers. For industrial workers, cyanide and manganese were the only COCs exhibiting an HQ greater than 1.

Blood lead concentrations were predicted to exceed 10 µg/dL in 35% of an exposed population of child residents. Blood lead predictions were not able to be generated for construction workers or industrial workers because the adult lead model is not calibrated for groundwater exposure.

Outside Landfill Boundary Deep Groundwater: Exposure to groundwater under the RME scenario was associated with estimated cumulative cancer risks exceeding the acceptable risk range for lifetime residents ($2x10^{-3}$), but not for industrial workers ($8x10^{-5}$). Construction workers are not exposed to deep groundwater outside of the landfill. COCs associated with cancer risk for residents included chromium, VC, TCE, arsenic, 1,4-dioxane, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, TCDD TEQs, delta-BHC, and dibenz(a,h)anthracene.

The maximum of the estimated target organ HIs exceeded 1 for the child resident (HI=56) and adult resident (HI=36), but not for industrial workers. COCs exhibiting HQs greater than 1 for residential receptors include DCE, TCE, aluminum, cobalt, iron, manganese, and cyanide. Additional COCs contributing to target organ-specific HIs exceeding 1, but that were individually associated with HQ contributions of less than 1, included arsenic and dioxin-like PCBs.

Blood lead concentrations exceeding 10 μg/dL were predicted for 0.27% of an exposed population of child residents. Blood lead predictions were not able to be generated for industrial workers because the Adult Lead Model is not calibrated for groundwater exposure.

Risks from Vapor Intrusion Risks: Incremental lifetime cancer risks (ILCR) for industrial workers and residents exposed to vapor intrusion in a building located within the landfill and in a building located outside of the landfill were within EPA's target risk range.

HIs for industrial workers and residents exposed to vapor intrusion in a building located within the landfill exceeded 1, while HIs for industrial workers and residents exposed to vapor intrusion in a building outside the landfill were less than 1. Mercury was the major contributor to the HI for a building within the landfill.

Pore Water Risks: ILCRs and HIs for construction workers, child recreational users, and adult recreational users exposed to pore water were within EPA acceptable levels at all sampling points for all three sampling events.

ECOLOGICAL RISK ASSESSMENT

The screening levels ecological risk assessment (SLERA) was conducted to evaluate the potential risk to ecological receptors that may be exposed to stream pore water. This SLERA focuses on pore water data from 2013 for the organic chemicals, and the pore water data from 2016 for metals. Seep, surface water, and sediment data were previously evaluated in the 2006 SLERA and/or 2008 baseline ERA (BERA), so those data were not included in this SLERA.

Risks to aquatic organisms resulting from direct exposure to chemicals in sediment pore water were evaluated by comparing the chemical concentrations in the sediment pore water to freshwater surface water screening levels. The maximum chemical concentrations in each pore water sample were used in the screening step as the exposure concentration to select chemicals of potential concern (COPCs). May and September 2013 pore water data were used for organic chemicals, and 2016 pore water samples were used for metals. The 2016 data were used for metals because it is more recent, and because samples in

2016 were analyzed for both total and dissolved metals (pore water samples collected in 2013 were not analyzed for dissolved metals).

Numerous inorganic and organic chemicals in the pore water samples were detected at concentrations greater than their respective surface water screening levels, indicating potential impacts to aquatic organisms are possible. After further evaluation, it was determined PAHs, pesticides, PCBs, and several metals (barium, copper, iron, and manganese) were likely to have the greatest potential for impacting aquatic organisms. Whether estimated risks due to copper were related to releases from the landfill was unknown, and considerable uncertainty was associated with the barium screening level. There was also uncertainty about whether PAHs and PCBs were actually dissolved in pore water. This was important because PAHs and PCBs are less bioavailable when bound to sediment particles. Nevertheless, based upon the SLERA, PAHs, pesticides, PCBs, barium, copper, iron, and manganese were retained as COPCs for risks to aquatic organisms.

1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

The U.S. Environmental Protection Agency (EPA) tasked Tetra Tech to perform a remedial investigation (RI) at the Lower Darby Creek Area (LDCA) site located in Philadelphia and Delaware Counties, Pennsylvania. The purpose of the RI was to meet the requirements of the EPA Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). The site was placed on the final National Priorities List (NPL) in June 2001.

The LDCA site consists of two separate landfill sites, and is divided into three operable units by EPA, as follows:

- Operable Unit 1 (OU-1): Clearview Landfill
- Operable Unit 2 (OU-2): Folcroft Landfill and Annex
- Operable Unit 3 (OU-3): Clearview Landfill Groundwater

EPA is the lead agency conducting RI activities for Clearview Landfill (OU-1 and OU-3), and a group of potentially responsible parties (PRPs) are responsible for performing RI activities for the Folcroft Landfill and Annex (OU-2). This RI report was prepared to present information pertaining to groundwater associated with the Clearview Landfill and its impact to nearby aquifers (OU-3), herein referred to as the “site.”

The primary objectives of the RI were as follows:

- Characterize the site conditions.
- Determine the nature and extent of contamination.
- Evaluate potential migration pathways for groundwater contaminants associated with the site.
- Assess potential risks posed by the site groundwater to human health, the environment, and ecological receptors.
- Develop information to evaluate potential environmental response clean-up options for OU-3.

This OU-3 RI report consists of several volumes. Volume I is the base report and is organized as follows:

- Section 1 presents an introduction and site background information.
- Section 2 contains information pertaining to the physical setting.
- Section 3 describes field investigation activities.
- Section 4 describes analytical results and discussion of field investigations.
- Section 5 describes the evaluation of contaminant fate and transport.
- Section 6 presents findings of the human health and ecological risk assessments.
- Section 7 lists references.

Remaining volumes include appendices to the base RI report.

1.2 SITE BACKGROUND

The LDCA site is located north of the Philadelphia International Airport (Figure 1-1), and in an industrialized portion of southeastern Delaware and southwestern Philadelphia Counties in Pennsylvania (Figure 1-2). Several creeks are near the LDCA site, including Hermesprota, Cobbs, Darby, and Thoroughfare. These creeks generally flow from north to south, and discharge into the Delaware River approximately 2.5 miles downstream of the LDCA site.

When the LDCA site was originally proposed for placement on the NPL on May 11, 2000, six contiguous properties located on both sides of Darby Creek were included as potential sources of contamination at the site: (1) Clearview Landfill; (2) Industrial Drive properties; (3) Sun Oil Darby Creek Tank Farm (includes the Catalyst Disposal and the Oily Sludge Disposal Areas); (4) former Delaware County Sewage Treatment Plant; (5) former Delaware County Incinerator; and (6) Folcroft Landfill and Annex (Figure 1-2).

However, after reviewing public comments, the EPA promulgated the LDCA site as two separate landfills: the Clearview Landfill and the Folcroft Landfill and Annex. Therefore, only these two landfills were formally included as sources of contamination when the LDCA site was placed on the NPL on June 14, 2001 (EPA, 2001a).

In 2006, the EPA finalized a legal agreement with 14 PRPs to perform the RI/FS for the Folcroft Landfill and Annex site. After the site was listed in NPL, the EPA became the lead agency responsible for conducting CERCLA-related investigations for the Clearview Landfill. Several PRPs are leading the investigation at Folcroft Landfill and Annex, with EPA's oversight and in coordination with the U. S. Fish and Wildlife Service (USFWS), the owner of the Folcroft Landfill.

1.3 SITE HISTORY

The two landfill sites, the Clearview Landfill and the Folcroft Landfill and Annex, were determined to be primary sources of contamination at the LDCA site. However, there are other probable sources that might affect portions of Darby Creek, including fisheries, wetlands, and other sensitive environments such as the John Heinz National Wildlife Refuge (NWR) at Tinicum, the largest remaining freshwater tidal marsh in Pennsylvania. While these sensitive environments are generally considered receptors, these environments could also contribute to contamination at the site given the tidal influence of creeks adjacent to the site. A general description of each source, including types of hazardous materials present, historical activities, and prior investigations and response actions, is provided below.

1.3.1 Clearview Landfill (OU-1)

The Clearview Landfill is located along the eastern bank of Darby and Cobbs Creeks, at 83rd Street and Buist Avenue. The landfill footprint currently resides partly in Delaware County and Philadelphia County (Figure 1-2), and includes the Clearview Landfill, the Eastwick Recreational Park (a.k.a., City Park) east of the landfill, and the Eastwick neighborhood. The administrative boundary of the Clearview Landfill is not clearly defined because former landfilling operations, which initially began on a Delaware County land parcel, spilled over onto property located within Philadelphia County (and City of Philadelphia) limits. During the mid-1970s, when development began on the Eastwick residential neighborhood (Figure 1-3), a considerable amount of waste was excavated and moved from the City of Philadelphia portion of the site to the Delaware County portion, where excavated materials were subsequently placed, graded and partially covered with fill. This resulted in the present areal extent of the Clearview Landfill lying almost entirely within Delaware County, while the City Park and Eastwick neighborhood lie within Philadelphia County.

The Clearview Landfill was privately owned and operated without a permit from the 1950s to the 1970s by the Clearview Land Development Corporation, when it was used for the disposal of municipal and industrial waste collected from the City of Philadelphia and portions of Delaware County (EPA, 2000). No documentation for installation of an engineered cover or functioning run-on/runoff control system exists for the Clearview Landfill.

The EPA's Environmental Photographic Interpretation Center (EPIC), environmental monitoring system laboratory completed an analysis of the Clearview Landfill (EPA, 1984b). As shown in historical aerial photographs of the Clearview Landfill (Figure 1-3), trash disposal at the landfill commenced in the early 1950s. The 1953 aerial photograph showed a 3.3-acre area with debris and earthen mounds north and south of an access road leading into the landfill from Buist Avenue. It also showed the landfill was situated on and surrounded by wetlands, with several small unnamed streams present north and west of the landfill.

In addition, junked vehicles, debris, and dark-toned material were visible east of the landfill along Buist Avenue.

The 1965 aerial photograph indicated Clearview Landfill had significantly expanded and covered approximately 55.5 acres, with substantial filling activities in the northern and eastern portions of the landfill. The former wetlands and streams appeared to have been filled, altering their courses to flow along the eastern border of the landfill, south of Darby Creek. Junked autos and debris were visible in the northwest corner of the landfill. A large pile of dark-toned material, a deep pit containing dark standing liquid, and a crane were clearly evident in this area. Numerous vehicles associated with landfilling activities (e.g., trash trucks, dump trucks, and earthmoving equipment) were also present on-site.

An aerial photograph taken in 1973 depicted the Clearview Landfill when it was closed. The landfill had expanded to the east and bordered Buist Avenue and covered approximately 65 acres. The stream formerly located east of the landfill had been filled. Pools of standing liquid and pits containing liquid (the constituents of the liquid are unknown) were present on the landfill surface. Tank cars (tanks) and dark stains were also observed, indicating liquid waste may have been brought to the landfill. A new access road leading directly from 84^{th} Street to the northwest corner of the landfill was present. Construction of a new structure (i.e., garage) had begun at the southern end of the landfill. The 1973 aerial photograph also revealed new residential properties had been constructed east of the landfill.

The 1983 aerial photograph showed new residential properties had been constructed at the southeastern corner of the landfill, possibly on top of a formerly filled area that had been visible in the 1953 aerial photograph. Construction of the recreation area at the northeastern end of the landfill had been completed. A well-traveled access road extending north from the active area in the southern portion of the landfill was also visible. Debris was scattered on both sides of the access road.

Historical aerial photographs clearly indicated former wetland areas located along and adjacent to the Delaware County and City of Philadelphia boundary line were filled and overlain by a thick layer of waste materials during landfill operations. These former wetland areas now appear topographically flat since waste materials were moved into the current landfill area.

A 2010 aerial photograph depicted a recent view of the landfill. Currently, several businesses are being operated at the southern end of Clearview Landfill in an area referred to as the Southern Industrial Area. City-Wide Waste Disposal Services operates a trash hauling business and stores trucks on-site. Other on-site businesses include municipal trash hauling businesses, auto repair and salvage businesses, and a truck/heavy equipment storage. Additional ad-hoc businesses also exist on-site.

Post-Closure Operations at Clearview Landfill and State Actions

In August 1973, due to several violations of state regulations (related to land disposal) and the absence of a landfill permit, the Pennsylvania Department of Environmental Resources (PADER), now known as the Pennsylvania Department of Environmental Protection (PADEP), took court action against the Clearview Land Development Corporation, and ordered it to cease all waste disposal activities at the landfill and follow a prescribed closure plan. Since the 1973 order, the property has continued to be used for other waste disposal operations, as described below.

PADEP granted ROMA Associates, Inc. a permit to construct and operate a batch asphalt plant at the southern portion of the landfill between 1973 and 1976. In 1976, the Philadelphia Redevelopment Authority (PRA) covered and seeded a portion of the landfill. However, further information on the cover type and its location was not available.

In June 1980, PADEP conducted an investigation of the reported dumping and open burning of waste materials at the Clearview Landfill. During that investigation, waste materials, including demolition waste, tires, furniture, household appliances, and mattresses were found at the top and on the southwestern face of the landfill. In addition, lumber, rugs, and other waste materials were found on the eastern bank of Cobbs Creek. PADEP issued a Notice of Violation (NOV) to the owner (Mr. Richard Heller) of Clearview Land Development Corporation.

In 1980 and 1981, Graves Resource Management (GRM) operated an unpermitted hazardous waste transfer, storage, and disposal facility on the southern part of the landfill near the bank of Darby Creek. A PADEP Order dated November 19, 1981, found that GRM continued to operate the facility in violation of Section 403 of the Pennsylvania Solid Waste Management Act (PASWMA). Numerous violations were cited, including acceptance of waste from unlicensed haulers, failure to maintain the facility so as to minimize the possibility of release of waste to the environment, storing unclosed containers at the facility, and no leak and spill prevention to manage waste. Due to these violations, the facility's interim status was revoked (EPA, 2000). In 1984, the owner of the operations, Mr. Albert F. Ingram, was sentenced to a prison term for committing two counts of transporting and dumping hazardous waste in 1982.

In November 1981, PADEP conducted another inspection of Clearview Landfill, and noted several large dump areas on the landfill with demolition debris, old car parts, bulky items, trash, tires, granular insulation, and black ash. In addition, large storage containers owned by GRM were present. Since these conditions were in direct violation of the August 1973 court-ordered closure of the landfill, PADEP ordered closure of the GRM facility and issued another NOV to Mr. Heller, for violations of the PASWMA and several sections of PADEP's rules and regulations.

A PADEP site inspection (SI) in September 1982 reported that a leachate pond was present on the landfill near Darby Creek, and a foul odor was detected in the stream. In October 1982, DeLorenzo Twin County Disposal applied for a permit to operate a solid waste transfer station at Clearview Landfill. In the late 1980s, three other companies (DeLorenzo Twin County Disposal, Bizarro Corporation, and Eagleville Excavating) were located at the landfill and operated by Mr. Heller (the owner of Clearview Land Development Corporation).

In December 1982, PADEP conducted an inspection of Clearview Landfill and noted that waste materials, including demolition debris, abandoned automobiles and parts, and scrap metals, had been deposited directly on the ground. PADEP issued a third NOV to Mr. Heller regarding violations of the PASWMA, and several sections of PADEP's rules and regulations. In 1984, a former employee of Clearview Land Development Corporation testified in court that he had helped bury chemicals at the landfill while he was employed from 1966 to 1973. In May 1984, December 1986, and October 1987, PADEP sent Mr. Heller additional NOVs for numerous violations of the PASWMA. According to the PADEP complaint of equity against Mr. Heller, illegal disposal of waste at the landfill continued at least until 1998, as evidenced by waste deposition observed at the landfill.

EPA Actions

EPA conducted site investigations in 1983 and 1984, and collected surface water, sediment, soil, and leachate samples from the landfill and Darby Creek. Analytical results indicated polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) in leachate samples, PAHs in soil samples, and PCBs in both stream and soil samples.

In September 1990, EPA observed areas of recent dumping throughout the landfill and three leachate seeps draining into Darby Creek on the western edge of the landfill. Contaminants such as volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and PAHs were detected in the leachate seeps and downstream sediments.

In May 1998, EPA conducted an area-wide investigation at the LDCA site to identify possible threats to human health and the environment posed by waste sources along Darby Creek, and to determine the placement of the LDCA site on the NPL. During this investigation, signs of erosion on the landfill cover were noted along the creek banks, and exposed debris piles, and leachate seeps were observed. Soil and waste samples collected showed high concentrations of heavy metals, PAHs, and PCBs.

In November 2011 to September 2012, EPA conducted a Time-Critical Removal Action (TCRA) in the Southern Industrial Area (SIA) of Clearview Landfill to address soil and waste contaminated with high levels of PCBs and PAHs, and, to a lesser degree, metals, pesticides, and dioxins. To delineate the extent of contamination, 173 soil borings were drilled up to 11 feet below ground surface (bgs) using direct push technology. Approximately 3,956 tons of soil containing PCBs at concentrations greater than 50 milligram/kilogram (mg/kg) were removed and disposed of off-site (Modern Landfill in Model City, New York), and 21,150 gallons of stormwater and groundwater that had contacted PCB-impacted soils were treated off-site (EQ Detroit, Inc. in Detroit, Michigan).

In addition, two 55-gallon drums containing investigation-derived waste (IDW) were disposed of off-site (EQ Wayne Disposal in Belleville, Michigan). Approximately 0.6 acres was excavated and covered with clean fill. The other area currently utilized by on-site businesses was not addressed during this TCRA. Contaminated soil in this area are covered by concrete pad and/or asphalt and will be addressed as part of OU-1 remedial action.

In September 2014, EPA finalized a Record of Decision (ROD) for OU-1 addressing soils, waste, and shallow leachate associated with Clearview Landfill. Data collected as part of the OU-3 RI will be used to refine design details for certain remedial components (e.g., the leachate collection trench and engineered wetland) described in the OU-1 ROD. The selected remedy included the following components:

1. Pre-design investigation (PDI) activities to delineate waste and contaminated soil boundaries.

2. Installation, maintenance, and monitoring of an evapotranspiration (ET) cover system over approximately 50 acres, including relocation of on-site businesses and demolition of all structures within the ET cover boundary, site grading, and storm water and erosion controls along the east bank of Darby Creek.

3. Removal and off-site disposal of polychlorinated biphenyl (PCB) principal threat wastes.

4. Excavation and consolidation of wastes and contaminated soils above cleanup levels within and beneath the ET cover.

5. Construction and maintenance of a leachate collection trench along the landfill creek banks and engineered wetlands to capture leachate and treat its contaminants prior to discharging to the creek.

6. Long-term monitoring of groundwater, leachate, landfill gas, surface water, and sediment to evaluate remedy performance and effectiveness.

7. Land and groundwater use restrictions to be implemented and maintained through institutional controls (ICs) and engineering controls to protect the integrity of the selected remedy, including the ET cover system, leachate collection trench, engineered wetlands, and to prevent exposure to soils outside of the ET cover above cleanup levels. Additional fishing advisories may also be required. Signs will be placed along the stream bank to warn fishermen of all fishing advisories and the potential risks from fish consumption. An Institutional Control Implementation and Assurance Plan (ICIAP) will be developed for OU-1 to ensure appropriate land and groundwater use restrictions are implemented, monitored, and maintained against future land owners.

1.3.2 Folcroft Landfill and Annex (OU-2)

The Folcroft Landfill and Annex is located within the John Heinz NWR at Tinicum (Figure 1-2). The refuge was established in 1972 as the Tinicum National Environmental Center to preserve the largest remaining freshwater tidal marsh in Pennsylvania, and to protect diverse fish and wildlife habitats. In 1980, Congress authorized the U. S. Department of Interior (DOI) to purchase the 62-acre Folcroft Landfill and Annex, so that the size of the refuge could be expanded.

The Folcroft Landfill is bordered by Darby Creek on the east, Thoroughfare Creek (a branch of Darby Creek) to the southeast, Hermesprota Creek to the west, the closed Delaware County Incinerator and Delaware County Sewage Treatment plant to the north, and a tidal marsh to the southwest. The Annex is bordered by Hermesprota Creek to the east, a business park to the west, residential developments to the north, and the tidal marsh to the south (Figure 1-2).

The Folcroft Landfill and Annex was owned and operated by Mr. Wilbur C. Henderson (Henderson-Columbia Corporation) from 1959 to 1974. This landfill was originally permitted solely for municipal waste (PADER Solid Waste Permit Number 10053); however, it reportedly received municipal, industrial, and hospital wastes, as well as incinerator ash and sewage sludge. In addition, the historical aerial photographic analysis indicates that disposal activities took place as early as 1953 (EPA, 1984b). By 1958, the landfill covered approximately two acres. The Folcroft Landfill was expanded to approximately 47.5 acres between 1958 and 1971. Landfilling operations extended to the Annex in 1971 and covered an additional 16.5 acres. Wastes were placed in wetland areas of the landfill along the edges of Darby, Hermesprota, and Thoroughfare Creeks.

Due to numerous permit violations and improper management, the landfill was closed in 1973. Closing activities included regrading the landfill, reducing the steep slopes, placing a cover, and seeding. Cover materials were dredged soil received from the construction of Interstate 95 and the Sun Oil Company refinery in Marcus Hook, Pennsylvania. An EPA inspection reported a lack of vegetative cover on the eastern half of the Folcroft Landfill.

Numerous investigations have been conducted at the Folcroft Landfill and Annex. Some of the findings from these inspections are briefly described below:

- Inspections of the Folcroft Landfill were performed between 1969 and 1973. During these inspections, the landfill reportedly received wastes from the Philadelphia Navy Yard, the Boeing Vertical Company, and the American Viscose Company. Oily sludge was being disposed of in the southern portion of the landfill; sewage sludge had been dumped on the east side of the landfill; refuse was being pushed directly into a swamp and adjacent water body on the east side of the landfill; and industrial wastes with oily material were being disposed of on the surface of the landfill. PADEP also found several leaking drums with liquid flowing toward Tinicum Marsh, and analyzed aqueous and waste samples collected from the Folcroft Landfill. Sampling results indicated that elevated levels of heavy metals such as cadmium, copper, chromium, nickel, zinc, and lead were present.

- A 1980 site inspection conducted by EPA identified that the following wastes had been disposed of in the landfill: oily waste, halogenated solvents, aromatic compounds, pesticides, metals, fly ash, asbestos, radioactive materials, municipal waste, hospital waste, and demolition waste.

- In July 1983, EPA Region 3 was notified of a fire at the Folcroft Landfill Annex, allegedly caused by the catalytic converter of a vehicle parked over underbrush on the landfill. EPA implemented an immediate removal action and removed a number of drums. During the removal action, drum and soil samples were also collected and analyzed. The contents of the drums, as described in a hazardous manifest, were: (1) resin – flammable solid, 170 gallons, waste code D001 (a solid waste that exhibits the characteristic of ignitibility); (2) flammable solids – flammable solid, 85 gallons, waste code D001; (3) water soluble lead – water soluble lead, 170 gallons, waste code D008 (lead concentration higher than 5 mg/L); and (4) asphalt – combustible solid, 85 gallons, waste code D001. In addition, a large quantity of illegally dumped hospital wastes was discovered throughout the surface of the landfill. EPA covered portion of the landfill with 6-8 inches of fly ash (filter cake) supplied by the Philadelphia Electric Company, followed by 12 inches of compacted soil and hydroseeding.

- Upon USDOI's acquisition of the 62-acre Folcroft Landfill and Annex in 1980, EPA, in coordination with USFWS and USDOI, investigated contamination in the landfill. The investigation, conducted in 1986, concluded that the John Heinz NWR in Folcroft Landfill was a source of heavy metals such as aluminum, cyanide, chromium, copper, and nickel (EPA/USDOI/USFWS, 1986a).

- In a follow-up site investigation, EPA and USFWS conducted a joint SI in 1988, and collected soil, sediment, surface water, and seep samples, and installed and sampled five groundwater monitoring wells. Three wells (MW-1, 2, and 3) were installed at the toe of Folcroft Landfill along a bermed area outside the fill area, a downgradient well (MW-5) was installed at the Folcroft Annex, and an upgradient well (MW-4) was installed near the former Delaware County Incinerator (Gannet Fleming, 1989). The analytical results indicated that groundwater samples collected from the monitoring wells contained metals and VOCs at elevated concentrations, and the surface soil samples contained heavy metals and PAHs at concentrations equal to or higher than three times background levels.

- Additional investigation was conducted by EPA in May 1998. During this investigation, several springs and seeps were observed on the southeastern edge of the Folcroft Landfill along Thoroughfare Creek (Figure 1-2). Signs of erosion on the landfill cover, exposed waste materials, and leachate seeps were also observed. The extent of erosion was most significant along the steeply sloped southern side, nearest to Thoroughfare Creek and the tidal marsh. Groundwater samples were contained heavy metals and VOCs, while soil samples contained heavy metals at levels equal to or greater than three times background concentrations.

1.3.3 Other Sources of Contamination

When the LDCA site was originally proposed for placement on the NPL, four other sources described previously (Figure 1-2) were also evaluated in the Hazard Ranking System (HRS) documentation record, but these sources were not included in the final NPL. Despite their exclusion as sources of contamination at the LDCA site, the EPA's sampling results indicate that contaminants detected in Darby Creek are likely associated with all of the aforementioned sources. These four sources are discussed briefly herein, in order from upstream to downstream location along Darby Creek.

1. **The Industrial Drive** is a short street that runs southwest from S. 84th Street (Hook Rd.), and parallel to Darby Creek. The properties along this street were used as an open dump in the early 1950s. Historical aerial photos (EPA, 1984b) indicate that the area was later utilized for various commercial and industrial purposes. It is currently occupied by salvage yards and a vehicle repair shop. Several sampling events in 1998 and 2000 documented the presence of elevated levels of heavy metals and PAHs in soil (Tetra Tech, 2000).

2. **The Sun Oil Darby Creek Tank Farm** is a crude-oil tank storage facility still in operation. It includes three possible contaminant sources, such as the Oily Sludge Disposal Area, the Catalyst Disposal Area, and the Neutralized Hydrofluoric Acid Trash Disposal Area, as per the HRS documentation record. This tank farm was constructed by the former Gulf Oil Refinery on a former rock quarry in the late 1940s

and early 1950s. It was purchased in 1994 and is currently owned by the Sun Oil Company. This site was used primarily for the disposal of waste materials generated from the Gulf Oil refinery, including oily sludge, various refinery catalysts, scrap metals, and neutralized acid waste. Sampling performed by EPA showed that groundwater in this property was contaminated with heavy metals and benzene. EPA also observed a thick oily substance overlying groundwater. In addition, a pipeline leak in 1999/2000 released more than 90,000 gallons of crude oil into the refuge impoundment, covering an approximately two-acre area.

3. **The former Delaware County Sewage Treatment Plant** discharged treated water directly to Darby Creek until the early 1970s. Sewage sludge taken from the drying beds was disposed of in the sludge disposal area alongside Darby Creek. The sludge was never removed and has become overgrown with vegetation. This plant is currently used as a pumping station by Delaware County and as an animal farm. Soil samples collected from this area contained elevated levels of heavy metals, PAHs, and PCBs, including Aroclor 1260.

4. **The former Delaware County Incinerator site** was used for the incineration of municipal waste between the mid-1960s and early 1970s. The incinerator was owned and operated by Delaware County, and handled approximately 500 and 800 tons of refuse per day. Some incinerator ash and residue were placed in a 15-acre area immediately south of the incinerator. Heavy metals and dioxin were detected in subsurface soil samples collected in this fill area by EPA in 1998. This property is now occupied by the Delaware County Emergency Services Training Center.

Note that the owners of the three properties (the former Delaware County Incinerator, the former Delaware County Sewage Treatment Plant, and the Sun Oil Darby Creek Tank Farm) intended to voluntarily address contamination on their properties under Pennsylvania's Land Recycling Program, Act 2 of 1995 - the Land Recycling and Environmental Remediation Standards Act, and other regulatory programs.

2.0 PHYSICAL CHARACTERISTICS OF STUDY AREA

This section describes the physical characteristics of the Clearview Landfill and surrounding areas. Information regarding site geology, soils, surface water hydrology, hydrogeology, human population, land use, and surface features are provided herein.

2.1 DEMOGRAPHY AND LAND USE

The site is located in an industrial section of Darby Township, in Delaware and Philadelphia Counties in Pennsylvania. In 2010, approximately 9,264 people resided in Darby Township, which is equivalent to a population density of 6,617 per square mile in 1.43 square miles (U.S. Census, 2010). Per the 2010 census, races in Darby Township were comprised of White Non-Hispanic (57.7%); African American (38.9%); Asian (0.6%); some other race (0.4%); two or more other races (2.2%); and Hispanic or Latino of any race (2.0%). The length of stay in Darby Township is significantly above state average, and house age is also above state average.

The Clearview Landfill is located geographically closer to the City of Philadelphia than to Darby Township. The U.S. Census Bureau (2010) reports that the total population in Philadelphia was 1,526,006, including White (41%); African American (43.4%); American Indian and Alaska Native (0.5%); Asian (6.3%); some other race (5.9%); two or more races (2.8%); and Hispanic or Latino of any race (12.3%). The population density was 11,379.5 per square miles. The City has a total area of 141.6 square miles, of which 134.1 square miles is land, and 7.5 square miles is water.

The EPA EJView 2010 census data show that about 3,666 people living immediately adjacent to Clearview Landfill, and 1,507 homes lie within a 0.5-mile radius of Clearview Landfill (Figure 2-1). Races in the area of 0.44 square miles around Clearview Landfill include White (12%); African American (81%); Asian (3%); other race (1%); and two or more races (3%). Residential properties are situated east of Clearview Landfill with population density increasing northeast toward Philadelphia. All residential properties in the Eastwick neighborhood are located within the City of Philadelphia boundary, while the Clearview Landfill is entirely located in Delaware County.

In general, land use within the study area is urban residential mixed with commercial, industrial, and natural area uses. Figure 2-2 shows the land use reported during the 1983 study of the Clearview Landfill using the Anderson Classification System (EPA, 1984a). According to this classification system, land uses of Clearview Landfill are Commercial/Light Industrial (162); Vacant Urban Lands (173); and Dump (177), although the entire land has been used for dumping waste. Residential land use is predominant close to the eastern side of Clearview Landfill.

2.2 SURFACE FEATURES

The LDCA site is in the small portion of the Coastal Plain Physiographic Province that occurs in Pennsylvania, and is topographically flat except for Clearview Landfill, and Folcroft Landfill and Annex. As shown in Figure 2-3, Clearview Landfill itself has the largest relief of any nearby land surface, rising to an elevation of over 80 feet above mean sea level (msl). Elevations in the vicinity range from 0 to 40 feet above msl.

For purposes of the OU-3 RI, Clearview Landfill was divided into three investigative sub-areas: the landfill, the City Park adjacent to the landfill, and the Eastwick residential community (Figure 2-3). Clearview Landfill is within Delaware County. However, the historical footprint of the landfill operation was known to extend to the City Park area, which is deeded in Philadelphia County (or City of Philadelphia). The adjacent City Park is a public recreational facility that includes tennis courts, basketball courts, playgrounds, and walking paths.

Clearview Landfill is also currently used by several businesses (a small portion of the southern area is classified as Commercial/Light Industrial in Figure 2-2), and includes an auto repair operation, a trash hauling business, and an area of paving material storage, equipment storage, and salvage operations (Figure 2-3). Historically, local residents access the landfill area for walking, all-terrain vehicle riding, deer hunting, and other activities. Abandoned cars have also been found at the landfill.

2.3 CLIMATE

The study area is within primarily a humid continental climate**.** This type of climate is typified by large seasonal temperature differences, with warm to hot (and often humid) summers and cold (sometimes severely cold) winters. Precipitation is usually well distributed throughout the year. Daily temperatures may reach 90 degrees Fahrenheit (°F) or above during the summer season; however, readings of 100 °F or above are comparatively rare. From about July to the middle of September, this area occasionally experiences uncomfortably warm periods of light wind movement and high relative humidity, making conditions oppressive. In general, the winters are comparatively mild, with an average of less than 100 days with minimum temperatures below the freezing point.

According to historical climate records (1940 to 2016) from the National Oceanic and Atmospheric Administration (NOAA, http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?pa6889), the annual average maximum temperature is 64.1 ^{o}F, and the monthly average maximum temperature ranges from 39.8 ^{o}F in January to 86.8 ^{o}F in July. The annual average minimum temperature is 46.2 ^{o}F, and the monthly average minimum temperature ranges from 25 ^{o}F in January to 68.2 ^{o}F in July. The annual average total precipitation is approximately 41.73 inches. Seasonal maximum precipitation totals 10.78 inches in spring months, 11.75 inches in the summer months, 9.83 inches in the fall months, and 9.36 inches in the winter months. Occasional local periods of drought have been known to occur, but humid conditions are the norm. The annual prevailing wind direction and speed for the site is southwest and 7.9 miles per hour, respectively. However, seasonal variation is more the norm than the rarity. The greatest frequency of prevailing winds from the northwest occurs predominantly in the fall.

2.4 SOILS

Soils in the vicinity of the Clearview Landfill have been heavily disturbed through many years of urban land use, and are generally described as "Made Land" by the U. S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Surficial geology in the area is generally unconsolidated sedimentary deposits that consist of gravelly sand with some interbedded clay and silt. In addition, part of the area has been extensively filled with fine-grained sediment, dredge spoils, and flood deposits. Soil types as mapped by NRCS (Web Soil Survey) are depicted in Figure 2-4, and select map units shown near Clearview Landfill are described briefly below:

- Made Land, Sanitary Landfill (Mf) – Soil under this map unit consist primarily of Udorthents, sanitary landfill, and similar soil, and are typically found in areas of cut and fill. The material is typically similar in the subsoil or substratum of adjacent soil. In fill or disposal areas, the soil material has more variable characteristics because it usually consists of varying amounts of material from the subsoil and substratum of nearby soil. Slope is reported to vary from 0 to 15 percent. Clearview Landfill, Industrial Drive, and northeast of Sun Oil Tank Farm are comprised of this type of soil.

- Urban Land (Ub) – This soil type represents approximately 85% of land in Philadelphia County. Its typical setting includes 0 to 8% slope and parent materials consisting of pavement, buildings and other artificially covered areas. This soil type comprises City Park in the Clearview Landfill site.

- Urban Land – Howell Complex (Uh): this soil type is typically mixed with urban land, and Howell and similar soil. In addition to typical urban land setting, this unit has Howell, of which parent material is unconsolidated sediment residuum, consisting of silt loam, sandy clay loam, and clay. It has 0 to 15% slope. This soil type is dominant in the Eastwick neighborhood east of Clearview Landfill.

- Wehadkee Silt Loam (We) – This type consists primarily of Wehadkee and similar soil. This soil type has 0 to 3% slope and does not drain well. It is typically found in flood plains and profiled as silt loam, silty clay loam, and stratified clay. This soil type is located in the west side of Darby Creek near Clearview Landfill.

- Glenelg Channery Silt Loam (GeB2) – This soil type is found further west of Darby Creek near Clearview Landfill and west of Industrial Drive. It drains well and has a slope of 3 to 8 percent. Its typical profile has 0 to 8 inches of Channery silt loam; 8 to 29 inches of Channery silt loam; and 29 to 50 inches of very channery loam.

Boring logs obtained during screening-level plume delineation provide further information on soil types at the site (Appendix D-1). Soils encountered in the field include the following Unified Soil Classification System (USCS) classifications:

- FILL – Fill materials were encountered throughout most of the borings at various depths. Fill materials include waste, which was mostly encountered on the Landfill surface and below topsoil in the City Park; and construction and debris (C&D), which could not otherwise be identified as landfill-derived waste and consisted of materials used for fill or backfill throughout the boring area.

- ML – ML soils consist primarily of silt with small percentages of sand. These soils were encountered below the waste and fill throughout the landfill and were generally encountered in alternating layers with SM soils.

- SM, SW, and SP – These soils consist primarily of sand, with small percentages of silt and gravel. These soils were generally encountered in alternating layers with ML type soils.

- GP – GP soils consist primarily of gravel with smaller percentages of sand. These soils were generally encountered underlying the SM and ML soils, and near the top of saprolite.

- CL – CL soils consist primarily of low plasticity or lean clay. These soils were generally encountered underlying the GP, SM, and ML soils., and overlying other GP soils and saprolite.

- Saprolite – Saprolite consists of rock that has chemically weathered in place into a soil-like condition. Saprolite was encountered on top of the bedrock and was generally overlain by GP or CL soils.

2.5 SITE HYDROGEOLOGY

Two aquifers, identified as the shallow and the deep aquifers, are present at the site. The shallow aquifer consists of groundwater within the overburden or soil overlying the bedrock, while the deep aquifer is within the crystalline bedrock underlying the shallow aquifer. Hydrogeology in the shallow aquifer is controlled by several factors, including the surface topography (in particular the landfill mound), the underlying geology, and Darby and Cobbs Creeks. The deep aquifer is controlled primarily by subsurface geology.

The two aquifers were assumed to be interconnected and unconfined. Water table elevations in the shallow wells appeared to be higher than those in deep wells, indicating downward hydraulic gradients at all well pairs. Therefore, it is likely hydraulically separate or weakly connected zones may exist above and below discontinuous silt or clay layers at the site.

Pneumatic slug testing was performed in July 2015 to better characterize aquifer properties, including hydraulic conductivity (K). Pneumatic slug testing consists of using air pressure to lower the head within a well to a level above the top of screen. After the well has been pressurized, a valve is opened to allow the pressure to drop, which allows the water level to rise. A data logging pressure transducer is then used to record water levels in the well until the levels return to the original (or static) water level. Slug tests were performed multiple times to generate an approximate hydraulic gradient for a well and calculate an average K values. Eight shallow monitoring wells (MW-01D, MW-04, MW-34S/D, MW-37, MW-38, MW-41D, and MW-42) were selected for slug testing. Average hydraulic conductivity values ranged from 1.11 at MW-37 to 144.29 feet/day (ft/day) at MW-38. K values for other well locations were between 1 and 5 ft/day. Test results are included in Appendix J.

Based on well drilling logs, several geologic cross-sections of the Landfill were generated to depict general stratigraphy. Figures 2-5, 2-6, and 2-7 show cross-sections across the Landfill and Eastwick neighborhood (in west-to-east direction along profile line A-A'); middle part of the Landfill (in south- to-north direction along profile line B-B'); and western edge of the Landfill (in the southwest-to-northeast direction along profile line C-C'), respectively. Note that shallow wells were used for the cross-sections since they represent site conditions better than deep wells, and their elevations and locations of the wells in the cross-sections are projected for interpretation purposes. Bedrock was encountered at depths ranging from about 18 feet below ground surface (bgs) in the Eastwick neighborhood to approximately 44 feet bgs at well MW-04 located in the SIA.

One of the key components to understanding groundwater flow in the shallow aquifer at the site is the large groundwater mound created by the raised topography at the landfill that dominates the surrounding area with its elevation. This feature is highly permeable due to the nature of the fill, and allows rapid infiltration of rainwater during storm events. This feature has created groundwater mounding and raises the water table elevation approximately 20 feet above the surrounding area. This mound acts to “push” water radially out from the landfill instead of the commonly anticipated flow pattern toward Darby and Cobbs Creeks. Beyond the influence of the mound, the regional flow overtakes the localized flow, then subsequently flows easterly towards Delaware River, as further discussed in Section 2.7.

The general geology of the shallow aquifer below the landfill is heterogeneous and anisotropic and consists of unconsolidated sediment of the Coastal Plain physiographic provenance. While the Coastal Plain sediment present in the area can be homogeneous, the landfill disturbance caused by landfilling, and construction of utilities and residences has likely changed the nature of the shallow aquifer, adding preferential pathways and potential flow barriers. However, overall flow direction of the shallow aquifer is toward the east beyond the influence of the landfill mound.

The general geology of the deep aquifer at the site is the crystalline bedrock of the Wissahickon Formation, and is both heterogeneous and anisotropic. Flow is primarily through factures in the bedrock (a.k.a., the secondary porosity), rather than through pore space in the rock itself (a.k.a., the primary porosity). As such, while regional groundwater flow may follow a noticeable trend, individual locations within the formation may vary wildly in flow characteristics. Overall, the groundwater flow in the deep aquifer is west to east, flowing beneath the Darby Creek and toward the Delaware River.

Darby and Cobbs Creeks are located along the western boundary of the landfill. The creeks are tidally influenced, and function as a boundary condition for the shallow aquifer at the site, preventing the transport of groundwater to the western side of the creeks. The shallow aquifer near the creeks fluctuates with the tide, indicating that the shallow aquifer is both discharging and recharging from the creeks at various points during the tidal cycle. Groundwater in the deep aquifer appears to flow below the creeks, and has little to no direct interaction with Darby Creek or Cobbs Creek.

2.6 REGIONAL GEOLOGY

In general, the surficial geology near the site has little or no remaining original outcropping surficial geology. A regional geology with chronostratigraphic units is shown in Figure 2-8. Clearview Landfill is on unconsolidated Coastal Plain sediment (Quaternary Trenton Gravel at the surface) overlying bedrock of the Wissahickon Formation.

The area is predominantly underlain by the Quaternary Age Trenton Formation in thicknesses of up to 40 feet, which consists primarily of medium- to coarse-grained gravelly sand interstratified with clayey silt and sand layers. Beneath the Trenton Formation lie the Pennsauken and Bridgeton Formations, which consist of cross-bedded, cemented sand with interbedded coarse-grained gravel. These formations have a maximum thickness of 30 feet and are present as outcrops in the general surrounding area, but their existence below the landfill is unknown.

Beneath these units lie the Cretaceous Age Potomac Group (silts and clays with inter-bedded sand and some gravel) and the Raritan Formation (containing various clay, sand, and gravel members); however, neither can be confirmed below the landfill.

The Precambrian Age Wissahickon Schist Formation is present beneath the layers described above. This formation consists primarily of oligoclase-mica schist, a group of metamorphic rocks containing parallel layers of flaky minerals such as mica. Because of the intense folding of this unit, its exact thickness is unknown, but is estimated to range from 8,000 to 10,000 feet. The Wissahickon Formation is present within the study area as outcrops in nearby stream channels, including Darby, Cobbs, and Hermesprota Creek Valleys, and underlies the northern end of the landfill. This formation was also identified in both Darby and Cobbs Creek upstream of the landfill during the OU-3 RI.

2.7 REGIONAL HYDROGEOLOGY

In general, groundwater regionally flows from the northeast to the southwest toward the Delaware River. As shown in Figure 2-8, the southern portion of the Clearview Landfill is underlain by Trenton Aquifer, and the northern part of the landfill is underlain by the Wissahickon Aquifer. Both are water table aquifers (i.e., an aquifer which is not confined under pressure; therefore, the water level in a well is the same as the water table outside the well.) Groundwater gradients are typically low in this type of aquifer (e.g., hydraulic gradient of about 10 feet per mile or less). Prior to the construction of the landfill, groundwater flowed from higher elevations to streams that discharge to the Delaware and Schuylkill Rivers. Wells located near rivers and creeks caused localized limited extent flow reversals of the typical hydraulic gradient, with recharge to the groundwater coming from the river, instead of groundwater flowing into the river (Greenman et al., 1961). Fluctuation of the groundwater level also occurs in water wells located near tidal waterways due to tidal water level changes.

According to the EPA Aquifer Classification System in the Guidelines for Ground-Water Classification Under the [1984] EPA Ground-Water Protection Strategy, Final Draft (EPA, 1986b), the aquifers underlying the Clearview Landfill are classified as Class I aquifers due to the presence of the John Heinz NWR within two miles of the landfill. As per Section 3.3.1 of the guidelines, the aquifer is classified as Class I when the groundwater is “ecologically vital,” and supports a sensitive ecological system and a unique habitat such as the John Heinz NWR.

2.8 PUBLIC WATER SUPPLY

All known residents in the Delaware and Philadelphia Counties are supplied with potable water by a public water supplier. Figure 2-9 shows water wells near the site and their water uses. No drinking water wells are known to exist on the Pennsylvania side of the Delaware River. On the New Jersey side of the Delaware River, drinking water wells for Gibbstown and the Borough of Paulsboro are located 5.5 and 4 miles south of Clearview Landfill, respectively.

2.9 SURFACE WATER HYDROLOGY

Surface water features associated with the LDCA site consist of streams and marsh areas, as shown in Figure 2-10. Streams in the area include Darby, Cobbs, and Hermesprota Creeks. The main stem of Darby Creek originates in Easttown Township, Chester County and is joined by a number of tributaries as it flows downstream. Cobbs Creek, the major tributary of Darby Creek, converges with Darby Creek north of the landfill. Darby Creek is then joined by Hermesprota Creek near marsh area in John Heinz NWR at Tinicum. Water from Darby Creek and the marsh ultimately flows into the Delaware River. The confluence of Darby Creek and the Delaware River is approximately 3.5 miles downstream of Clearview Landfill. An impoundment and tidal wetlands exist within the John Heinz NWR.

Darby, Cobbs, and Hermesprota Creeks were listed as impaired waters under Section 303(d) of the 1972 Clean Water Act. Due to pollution issues, portions of Darby and Cobbs Creeks near the Clearview Landfill were listed as requiring a Total Maximum Daily Load (TMDL) that specifies the maximum amount of a pollutant that a water body can receive while still meeting water quality standards. A small portion of Cobbs Creek is listed as not requiring a TMDL, but is still addressed with pollution issues. Portions of Darby and Hermesprota Creeks are listed as being unassessed due to insufficient data.

Tidal influence exists throughout the lower portion of Darby Creek and upstream as far as Clearview Landfill. On average, Darby Creek is tidal up to the confluence of Darby Creek and Cobb Creek, located near the northern portion of the landfill, but the extent of tidal influence changes depending on climate conditions.

Flood plains encroach significantly onto the study area. Figure 2-10 shows the 100-year flood plain line superimposed onto wetlands mapping. Hurricane Floyd (in 1999) caused significant flooding throughout the Cobbs and Darby Creeks, including the Eastwick neighborhood and surrounding area, and inundated many homes. Based on the mapping of the flood plain, the ground surface elevation, and other information, it appears that flooding may be more common than indicated by 100-year flood plain mapping.

2.10 WETLANDS

The John Heinz NWR consists of approximately 1,200 acres of wetlands within two miles of Darby Creek (USFWS, 2001). The National Wetlands Inventory (NWI) wetland classification in the study area is shown on Figure 2-11. Darby Creek and its downstream portion are classified as riverine, tidal, emergent wetlands. Two wetlands, including one near Clearview Landfill and the other near the Sun Oil Tank Farm, are classified as palustrine, emergent wetlands. Additional wetlands located on the western side of Darby Creek near the Sun Oil Tank Farm are classified as palustrine, open water/unknown bottom and palustrine, unconsolidated bottom wetlands. In the lower portion of the site just east of Darby Creek, a 40-acre area is classified as lacustrine, limnetic, open water/unknown bottom wetlands. Additionally, 131 and 132 acres of wetlands areas south of the Folcroft Landfill and Annex (respectively) are considered riverine, tidal, emergent wetland, and palustrine, emergent, persistent wetlands.

As part of the remedial design effort for OU-1, wetland delineation was conducted in October 2015 to inventory the existing wetland resources on-site. Four wetlands were identified and classified as one palustrine forested (PFO1), two palustrine emergent (PEM1), and one marginally wet palustrine forested (PFO1) wetlands in accordance with Cowardin class (Cowardin et al., 1979) and based on dominant vegetation strata and type. They are denoted as W1 through W4, respectively, in Figure 2-11. If these wetlands are disturbed during construction of the OU-1 remedy, they will be restored by EPA.

2.11 ECOLOGY

During the RI, biological and ecological information for the LDCA site was collected with particular emphasis on identifying sensitive environments, endangered species and their habitats, and species consumed by humans or found in human food chains. A discussion of the ecological risks posed by OU-3 is presented in Section 6.2.

2.11.1 Eco-Region and Physiographic Area

Ecoregions denote areas of general similarity in ecosystems, and in the type, quality, and quantity of environmental resources. A roman numerical hierarchical scheme has been adopted for different levels of ecological regions. Level I is the coarsest level, dividing North America into 15 ecological regions; Level II divides the continent into 52 regions; Level III contains 104 regions in each continent; and Level IV is a further subdivision of Level III ecoregions (EPA, 2003).

Figure 2-12 shows Levels III and IV Ecoregions in the EPA Region 3. The LDCA site is in part of the Delaware River Terraces and Uplands zone (Zone 63a) of the Middle Atlantic Coastal Plain Ecoregion (Level IV). In general, the Level IV Ecoregion is a narrow, marshy, nearly level-to-rolling lowland adjacent to the Delaware River estuary and Delaware Bay that extends from southeastern Pennsylvania to southeastern Delaware. It is characterized by low, nearly level terraces; an ocean modified climate; a long growing season; freshwater inter-tidal marshes; saltwater marshes; and small, sluggish, meandering streams.

Low lying areas are commonly saturated or flooded during the growing season. Saline marsh deposits dominate, and alluvial and estuarine sand and silt are also widespread. These deposits are underlain by unconsolidated and easily eroded Quaternary gravels, sands, and silts. Elevations are less than 60 feet, and local relief is less than 35 feet. Streams have low gradients and are tidally influenced (EPA, 2003). Note that the Delaware River is saline up to approximately river mile 93 (near the Walt Whitman Bridge) from the mouth of the Delaware River near the Atlantic Ocean.

2.11.2 Threatened and/or Endangered Species of Concern

In December 2016, a Pennsylvania National Diversity Inventory (PNDI) environmental review was submitted to determine if there may be potential impacts to threatened and endangered and/or special species and resources within the project area. The response from several state and federal agencies, including USFWS, Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry (PADCNR, 2016; 2017), Pennsylvania Fish and Boat Commission (PFBC, 2017), and the Pennsylvania Game Commission (PGC, 2017) indicated that no impact would be anticipated; therefore, no further review or coordination with these agencies would be required. This response represents the most up-to-date review of the PNDI data file and is valid for two (2) years. The PNDI response letters from the review agencies are in Appendix A.

2.11.3 Sensitive Environments

John Heinz NWR (the Refuge) at Tinicum is the primary sensitive environment in the vicinity of Clearview Landfill. The Refuge existed prior to the first settlement in the region in 1634 (USFWS, 2003), and is home to a variety of wildlife. Birdwatchers have recorded more than 280 bird species in and around the Refuge. The Refuge is one of the few places in Pennsylvania where the state-endangered red-bellied turtle and southern leopard frog can be found. It is located on the Atlantic Coastal Plain, which is only present in the extreme southeastern corner of the state, and has been highly impacted by industrial activity. Other sensitive areas include wetland areas along the banks and flood plains of Darby Creek.

Clearview Landfill is also located on a major waterfowl migration route that is part of the Atlantic Flyway. Numerous waterfowl have been observed on the waterways near Clearview Landfill. Within the general study area, wetlands serve as resting areas for migrating waterfowl located in the Refuge. Water from upstream areas of the City of Philadelphia and portions of Delaware County eventually enters the Refuge via Darby Creek. Moreover, Cobbs and Darby Creeks are listed as warm-water fishing streams by the PFBC.

2.11.4 Habitat Quality

Although the LDCA site is located within a highly urbanized industrial setting that could negatively affect habitat quality in the study area, there are several significant and unique habitat areas adjacent to the site. The John

Heinz NWR at Tinicum is an approximately 1,200-acre wetland that represents the largest freshwater tidal marsh remaining in Pennsylvania. Additional information on the Refuge, including a list of animal and plant species can be found at http://www.fws.gov/heinz/index.html.

Point source and non-point source pollution within the Darby Creek watershed affect water quality and available food-chain support for wildlife, including bird species within the Refuge. Growing industrialization continues to encroach on the Refuge, resulting in reduced open space and increased pressure on Refuge lands. Human activities (e.g., recreational use and water level control) also affect the quality of the habitat for nesting birds in the Refuge.

The 145-acre shallow impoundment in the John Heinz NWR is connected to part of the tidal marsh via a tidal gate. This large open water, along with the adjacent heavily vegetated tidal wetland, forms an ideal habitat for migratory waterfowl. The impoundment also contains a large population of common carp. Carp foraging increases the turbidity of the water and uproots aquatic vegetation. The increased turbidity covers the vegetation at the bottom of the impoundment with silt and eventually kills it. Canadian Geese in the area and carp have destroyed areas that have been newly planted with wild rice, which historically dominated the marsh.

Invasive species are abundant in the watershed as well as the Refuge. The extent of the phragmites is of great concern. Other invasive species that require management and control and limit the productivity of the emergent wetlands l include spadderdock and purple loosestrife. Japanese knotweed, lesser celandine, Asian tearthumb, Japanese honeysuckle, mile-a-minute, bittersweet, Paulownia, kudzu, and Ailanthus are also pervasive in the upland habitat of the Refuge.

The habitat quality around Clearview Landfill is considered poor because of urbanization that causes constant disturbance, poor natural food sources (except for scavengers), and lack of quality cover on Made-Land soil. Cobbs Creek upstream of Clearview Landfill has severely eroded. The general habitat quality within/near the Clearview Landfill appeared to be of poor quality during field observations. However, the on-site wooded area and the riparian corridor do represent habitat that is unique to the urbanized setting, and their habitat quality is better than that in the surrounding residential area.

3.0 STUDY AREA INVESTIGATION

This section describes field activities conducted during the RI. The primary objectives of the OU-3 RI were to collect data of sufficient quantity and quality to fully define the nature and extent of groundwater contamination at the site, and to fill data gaps that remain before the remedy can be selected. More detailed information is available in the final work plan (WP) (Tetra Tech, 2013b) and in the sampling and analysis plan (SAP) (Tetra Tech, 2013a). Deviations from these approved plans are also described herein.

The OU-3 RI utilized dynamic investigation and sampling techniques (Triad approach) to foster modernization of technical practices for characterizing contaminated groundwater (and other media) at the site. The goal of the Triad approach is to manage decision uncertainty; that is, it increases confidence that project decisions (on the nature and extent of contamination, and investigative method selection) are made correctly and cost-effectively. The foundation for such decisions is the conceptual site model (CSM). The primary elements of the Triad approach are systematic project planning, dynamic work strategies, and real-time measurement technologies. A preliminary CSM from existing information (i.e., OU-1 RI data) was developed, and a list of the unknowns (e.g., data gaps) was identified. Work planning documents such as SAP were written in a dynamic and flexible mode to adapt in real-time as new information becomes available. Multiple CSMs were developed during the RI as field data were collected and data gaps were filled.

3.1 PROJECT OBJECTIVES

Although extensive environmental data were collected during the OU-1 RI, significant data gaps existed that limited EPA's ability to fully define the nature and extent of contaminated groundwater at the site, and its impact to nearby creeks and aquifers. Therefore, the objectives of the OU-3 RI were collecting field samples and data to determine:

- The movement of groundwater from the landfill into or beneath adjacent surface water bodies.
- Interactions along the groundwater/surface water interface adjacent to the landfill.
- The nature of potentially impacted bedrock aquifer near the landfill.
- The nature and extent of impacted groundwater migrating eastward outside the historical landfill boundary within the coastal plain aquifer and potentially the bedrock aquifer.

3.2 PRIMARY RISK DRIVERS AND SELECTION RATIONALE

3.2.1 Preliminary Risk Screening

Preliminary risk screening for the most recent OU-1 RI groundwater sampling data (April/May and August 2012) was performed to determine primary risk drivers (for both ecological and human health), and to determine chemicals of potential concern (COPCs) that were detected frequently at concentrations exceeding the screening criteria, such as:

- EPA Region 3 regional screening levels (RSLs) for tapwater (EPA, 2017).
- Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs).
- EPA Region 3 Biological Technical Assistance Group (BTAG) fresh-water screening benchmarks (EPA, 2006).
- Pennsylvania water quality standards (WQS), PA Code, Title 25, Chapter 93.
- EPA water quality criteria (WQC).
- PADEP Act 2 medium-specific concentrations (MSCs) for organic/inorganic regulated substances in groundwater.

The RSLs, MCLs, and MSCs were used to meet EPA's goal for restoring contaminated groundwater, or for protecting its beneficial use within a reasonable amount of time when selecting a groundwater remedy and documenting the site response actions. Other criteria were considered since site groundwater most likely discharges into the nearby creeks.

To select primary risk drivers or COPCs, the frequency of sampling results exceeding the lowest screening value, and the percent exceedance of the maximum detected concentration of each analyte over the lowest screening value (e.g., maximum concentration/lowest screening value x 100), were calculated. For an optimized sampling strategy employing the Triad approach, select COPCs were further narrowed down, based on their lateral distribution and prevalence throughout the site, as wells as their risks to the environment and human health.

3.2.2 Conceptual Site Model

In cooperation with EPA Office of Superfund Remediation and Technology Innovation (OSRTI), all available site data from previous investigations (e.g., OU-1 RI sampling data and hydrogeological information) were gathered to develop a baseline CSM in three dimensions (a.k.a., 3-D visualization) and to identify areas with data gaps. The model was used to generate 3-D visualizations of the aquifers and associated plumes for select COPCs. The modeled plume maps were evaluated to determine which COPCs could be used to accurately depict characteristics of the site plume. The CSM was continually updated as the OU-3 RI data became available, until the plume had been fully delineated horizontally and vertically, and all data gaps had been filled.

3.2.3 Primary Risk Drivers

Based on preliminary risk screening and a baseline CSM focusing on the distribution, prevalence, and toxicity of COPC throughout the site, the following risk drivers were selected to develop work-planning documents, evaluate real-time measurement technologies, perform field sampling, and define a screening-level plume for the site:

- 1,4-dioxane
- Arsenic
- Trichloroethene (TCE)

Of these, TCE was selected to determine the probable source of contamination detected in off-site wells (south of the landfill). During 2011 supplemental groundwater investigation conducted as part of OU-1 RI, elevated concentrations of TCE were detected in groundwater samples from two off-site deep wells: MW-13I and MW-13D (e.g., 37 and 7.2 µg/L, respectively) (Figure 3-1). Since these wells are downgradient of the landfill, it is possible that TCE detected in the deep aquifer may be originating from the landfill.

3.3 SITE RECONNAISSANCE

The initial site reconnaissance commenced in June 2012. The purpose of the site reconnaissance was to obtain general and technical information on current site conditions that would support the scoping, scheduling, and the development of the work-planning documents as well as a baseline CSM. The details for the site reconnaissance activities are in Appendix B. Additional site reconnaissance was performed in February/March 2013 to evaluate potential sampling techniques and real-time sensing tools for sampling effectiveness and implementability.

3.3.1 Initial Site Reconnaissance

Initial site reconnaissance was performed in June 2012. Details on the various activities that were conducted during the initial site reconnaissance are described in site reconnaissance report (Tetra Tech, 2012c).

Well Conditions Assessment: Well inspection was performed for 28 existing monitoring wells (MW-01S/D, MW-02, MW-03, MW-08, MW-09, MW-04, MW-05S/D, MW-06, MW-07S/D, MW-10, MW-11, MW-12, MW-13S/I/D, MW-14S/D, MW-15S/D, MW-16S/D, MW-17S/D, and MW-18S/D) in accordance with Tetra Tech Standard Operating Procedures (SOP) No. GH-1.2 – Evaluation of Existing Monitoring Wells and Water Level Measurement (Tetra Tech, 2012c). The purpose of this inspection was to evaluate the physical conditions of the protective casing, cap, lock, and the cement seal surrounding the protective casing; and the depressions or standing water around the casing. In addition, water level measurements for all existing wells were made to update groundwater flow directions and to support the development of a baseline CSM. The water quality parameters measured are summarized in Table 3-1.

Tetra Tech performed the following tasks during this assessment:

- Visual inspection of the condition of the wells, including the surface casing, inner cap, lock, and concrete pad (see Figure 3-1 for existing monitoring well locations).

- Measurement of well depth to the bottom of the well (to estimate the amount of sedimentation at the bottom of the well) using a water level probe, including depth to water measurements.

- Water quality measurements using the In-Situ Profiler XP multi-parameter probe, including specific conductivity, dissolved oxygen (DO), temperature, pH, and oxidation-reduction potential (ORP), as recorded by the In-Situ Rugged Reader data logger.

Most of the wells were found to be in good condition, with minimal sedimentation; therefore, minimal to no rehabilitation was needed for these wells. Two monitoring wells (MW-1D and MW-12) were filled with a thick layer of black scum with strong leachate-like odor; therefore, water quality parameters were measured at top water surface to prevent damage to the equipment. In addition, logging and/or water quality measurements for monitoring wells MW-8, MW-10, and MW-11 were not performed due to an obstruction in the well casing or lack of water.

The conductance of a solution is a measurement of its ability to conduct a current. It is a property attributable to the ions in solution, and conductivity increases as ion concentrations increase. Therefore, elevated levels of specific conductivity may indicate the presence of leachate in groundwater, and the extent of impacted groundwater. The groundwater specific conductivity values varied throughout the monitoring wells, ranging from 133 to 8,837 micro Siemens per centimeter (µS/cm). Relatively low specific conductivity (<400 µS/cm) was observed in monitoring wells MW-15D, MW-16D, MW-17S/D, and MW-18S/D. Specific conductivity measured in monitoring wells MW-17S/D and MW-18S/D may represent a background level (<300 µS/cm). Most elevated conductivity values were generally associated with monitoring wells located within the historical landfill footprint. The highest specific conductivity (8,837 µS/cm) was detected in monitoring well MW-13D within the screen interval of 120 and 130 feet below ground surface (bgs). However, two other shallower wells (MW-13S/I) in the same location exhibited much lower specific conductivity (i.e., 1,370 µS/cm within the screen interval of 20 and 30 feet bgs, and 701 µS/cm within that of 60 and 70 feet bgs, respectively). The elevated specific conductivity observed in a monitoring well MW-13D may be attributed to naturally-occurring mineralogy (e.g., calcium, potassium, etc.), or grout used to seal the annular space during well completion, as further discussed below.

The pH of groundwater is an indication of the intensity of the prevailing buffer system and affects species ionization. Measured pH of groundwater samples from most of monitoring wells was in the range of 6.5 and 7, which is characteristic of a carbonate buffering system. Three monitoring wells, including MW-17S/D and MW-18S exhibited slightly acidic pH (<6). Groundwater samples from monitoring wells MW-13I/D indicated extremely alkaline conditions (pH>11). Such a high pH was also observed in a groundwater sample from monitoring well MW-14D. A well with an abnormally high pH (and/or high specific conductivity) may be contaminated with alkaline grout (cement and/or bentonite) used to seal the annular space during well completion. Nielson (1991) described four ways that very alkaline water from annular seals can enter well screen areas: (1) wells located in low permeability units with strong vertical gradients (i.e., grout bleeds directly downward); (2) grout injected into the screened area of the well; (3) bentonite seals too thin or ineffective; and (4) fractured rock providing channels around bentonite seals. Wells MW-13I/D and MW-14D were redeveloped with a surge block method in April 2013.

High pH and specific conductivity values associated with well cluster MW-13I/D and well MW-14D were determined to be problematic; therefore, additional wells (MW-21 and MW-22) were installed to the north, south, and east of well cluster MW-13 to help delineate the plume. Regardless, these wells were used to monitor groundwater conditions since it represented a point of high contaminant concentrations and/or was helpful in providing plume delineation. Additional investigations, including well redevelopment, were performed for well cluster MW-13 and MW-14D, but were unsuccessful in addressing the variation in specific conductivity readings.

The ORP measured during site reconnaissance indicated the oxidizing or reducing conditions present in the aquifer were characteristic of a reducing environment (i.e., negative ORP; see Table 3-1), except wells

MW-13S/I, MW-17S, and MW-18S. Groundwater DO values were also low (<1 mg/L) in most wells, as a reducing condition is prevailing. Water levels and water quality parameters were also measured during long-term groundwater monitoring events.

Creek Conditions Assessment: The primary objective of this assessment was to observe overall creek conditions, photograph of areas of interest (e.g., seep locations), and screen sediment and surface water quality in the field.

Several areas along the creeks are eroded and expose waste materials. The waste in the embankment appears to be part of the landfilled materials, while materials such as car/truck chassis in the creeks appear to result from dumping. Leachate may be discharged to the creek through the exposed landfilled materials, and the semidiurnal tidal flow may allow surface water to regularly flush contaminants from the waste. Seep locations were identified along the eastern bank of Darby and Cobbs Creeks, starting at the southern end of the landfill near S. 84th Street up to the northern end of the landfill. These locations were recorded with a global positioning system (GPS) and visually inspected. Field screening of surface water and sediment near the seep areas, both at the embankment and in the creeks, was performed for temperature, pH, and specific conductivity with an Oakton pH/Con 300 w/T-Handle Probe.

All work performed within the creeks started downgradient (at the southern end of the landfill) at low spring tide. The monthly tidal predictions for Darby and Cobbs Creeks at the John Heinz National Wildlife Refuge (NWR), located less than one-quarter mile away from the landfill, were verified by the U.S. Fish and Wildlife Service's website (http://www.fws.gov/heinz/recreate.htm). Limited inspection of the creek banks and surface water for signs of seepage was performed using an infrared (IR) thermal image camera with assistance by the United States Geological Survey (USGS).

Table 3-2 includes field screening results of temperature, pH, specific conductivity, ORP, and DO for surface water and sediment (specific conductivity only) at designated stations ST-1 through 18 (Figure 3-2) along Darby and Cobbs Creeks. The average temperature of surface water in June was about 17 to 18 degrees Celsius (^{o}C). The pH of surface water was generally in the neutral range. The measured ORP values at stations ST-1 through ST-6 were similar at around 250 millivolts (mV), indicating that surface water is in an aerobic condition. The measured ORP values at stations ST-8 through 18 were less than those observed at lower Darby Creek, ranging from 107 to 195 mV. The DO concentrations of surface water along the stations ranged from 6.05 to 9.78 mg/L, which is typical of fresh water when oxygen dissolves into water and the wind stirs the water; as the waves create more surface area, more diffusion occurs. The specific conductivity in surface water near stations ST-2 through ST-18 ranged from 244 to 352 µS/cm. The specific conductivity in surface water near station ST-1, immediately downgradient of active leachate seep area, was 1,345 µS/cm. The measured specific conductivities in creek sediment were similar to those observed in surface water, except at a few locations, including stations ST-2, ST-3, ST-11, and ST-12. These locations are located near active leachate seep areas, and exhibited elevated specific conductivity (i.e., >1,000 µS/cm for ST-2 and ST-3; 724 µS/cm for ST-11; and 610 µS/cm for ST-12). The sheen noted at both stations ST-13 and ST-17 could not be accessed safely to sample due to the presence of waste materials along their embankments.

To augment the assessment of creek condition conducted during the initial site reconnaissance, USGS performed several tasks to determine if shallow groundwater combined with leachate was discharging to adjacent creeks. Tasks involved included infrared seep detection, surficial geophysics, and pore water conductivity measurements as described in Section 3.5. The results from these tasks, along with the information generated during the initial site reconnaissance, were used to help select pore water sampling locations (Section 3.5.4).

Site Accessibility Assessment: The primary scope of work (SOW) for the OU-3 RI was to fully define the nature and extent of groundwater contamination, which might have required continuous sampling and monitoring well installation in unconsolidated and soft/fractured bedrock, possibly through the waste materials. The Clearview Landfill is heavily wooded and has very steep slopes near the creek banks. Therefore, mobilizing heavy equipment to certain drilling locations was challenging. Two access roads were constructed during the OU-1 RI; however, these roads had not been maintained. Sonic drilling (also referred to as vibratory drilling and rotosonic drilling) was selected for monitoring well installation, due to its rapid drilling rates and the reduced volumes of secondary waste generated during drilling. Site accessibility for a sonic rig was assessed during site reconnaissance.

Tidal Influence Assessment: Darby and Cobbs Creeks are tidally influenced tributaries of the Delaware River adjacent to Clearview Landfill. Tidal flow regularly changes the flow direction and rates in the creeks, which also changes the groundwater flow from and to the creek. To assess possible tidal influence, water-level recording pressure transducers were installed in three gauges (SG-1, SG-2, and SG-3) in both creeks, and in 10 wells (MW-02, MW-03, MW-04, MW-05S, MW-05D, MW-06, MW-07S, MW-08, MW-09, and MW-13S), as shown in Figure 3-3. Transducers remained in place for one month, and water-level measurement data (as well as specific conductivity for monitoring well MW-13S and three gauges) were downloaded on a bi-weekly basis.

Hydrographs for each of the well transducer locations are included in Appendix B. Figure 3-4 shows the changes in groundwater elevations at three monitoring wells (MW-03, MW-05D, and MW-06), corresponding to water levels in the creeks and rain events in May-June 2012. The transducer data clearly indicate these wells were tidally influenced by the creeks. Three major storm events occurred during data collection, and the storm event on June 22, 2012 showed that these three wells had a marked response to tidal influence. Several other wells (e.g., MW-04 and MW-05S) also demonstrated minimal daily fluctuations in water levels. EPA plans to measure water-level elevations using piezometers in the future to better determine the effects of tidal influence.

Further evaluation revealed well MW-05S may not be deep enough to intercept the tidal zone. Well MW-05S was also installed in a clay and sand lens that may be hydrologically disconnected from surrounding soils. This same layer was identified in well MW-05D as being between two layers of fill, indicating that it was also fill, and could be disconnected due to the low hydraulic conductivity of the soils. Well MW-04 was also installed in fill. Due to the heterogeneity of the material and the potential for anisotropic flow, MW-04 may have been installed in a hydrologically isolated area.

The tidal influence in the creeks reflects a complex groundwater/contaminant migration pathway to the creeks. The data indicated creek water flows into the landfill at high tide, and flows out of the landfill at low tide. This may be creating a “flushing” condition, drawing contamination out of the landfill. Tidal effects contribute to a complex groundwater flow and contaminant transport pathway for portions of the site adjacent to creeks. The influence of pore water contamination may extend from a few feet to tens of feet depending on soil types along the creek embankments, hydraulic conductivity, presence of waste materials, and variations in elevation.

Figure 3-5 shows specific conductivity measured in the three gauges (SG-1, SG-2, and SG-3), and at well MW-13S. Well MW-13S was selected for conductivity recording due to its position at or near the historical Darby Creek channel, which could be more hydraulically conductive than the surrounding soils and tidally influenced. In general, no direct correlation between specific conductivity measured at well MW-13S and the creek was found. Specific conductivity observed in this off-site well remained relatively constant at 1,440 µS/cm throughout the monitoring period, and tidal variation in the water table elevation was not observed. The major decreases in conductivity as shown in Figure 3-5 were correlated with storm and rainfall events when a greater volume of freshwater was introduced into the study area.

3.3.2 Field Testing of Sampling Technologies

Several field test kits (e.g., Color-Tec® and Quick™ for inorganic arsenic), groundwater assessment techniques (e.g., phytoscreening, MiHPT®, and direct push sampling), and creek assessment technologies (e.g., thermal imaging and remote sensing) were field tested to determine their effectiveness in analyzing select risk drivers (Section 3.2.3) and implementability in the site field conditions. These technologies were tested concurrently to the extent practicable. Based on testing results, refinements were made to field operating procedures for these technologies in the SAP before full-scale implementation.

Field Test Kits: Several field test kits such as Color-Tec® and Quick™ were evaluated for detecting inorganic arsenic during the scoping phase of the RI. In February 2013, groundwater samples collected from existing monitoring wells were shipped to the EPA Environmental Response Team (ERT) laboratory in Edison, New Jersey. ERT compared the field test kit results to the fixed laboratory results to assess quality assurance/quality control (QA/QC). The test kit results were unacceptable, and were therefore not used during the full-scale investigation.

Phytoscreening: Phytoscreening involves tree core sampling and chemical analysis. The fundamental principle behind tree sampling is that dissolved contaminants are absorbed through the plant roots, and move upwards along with sap into the trunk and then into leaves. Phytoscreening is a non-invasive survey tool, and has been used successfully for investigation of groundwater contaminated with water soluble and non-volatile organics/inorganics, and particularly for chlorinated solvents (USGS, 2008). Therefore, phytoscreening could assist with determining the approximate lateral extent of the contaminant plume, and selecting locations for other sampling methods subsequently performed.

Pilot phytoscreening testing was conducted by USGS in March 2013 to determine its potential for full-scale application. A permit was obtained from Philadelphia Parks and Recreation (PPR) for tree coring in Eastwick Recreational Park (a.k.a., City Park) and in the Eastwick neighborhood.

Concurrent groundwater samples were also collected in March 2013 using a bailer from select existing wells (i.e., MW-01D, MW-05D, MW-06, MW-12, and MW-16S) in which a site-related risk driver (1,4-dioxane) had previously been detected; a background well (i.e., MW-17S) was also sampled. All wells were purged and allowed to settle for at least one day prior to sampling. The samples were analyzed for 1,4-dioxane by the EPA ERT laboratory.

One to three tree core samples near these wells were collected at a height of about 4-5 feet above ground surface. Cores were 2-3 inches long (excluding the bark) and 0.169 inches in diameter and were collected using a standard increment borer, following the method detailed by Vroblesky (USGS, 2008). General information on tree species, core diameter, and coring height was recorded, and the location of each tree sampled was mapped with a handheld global positioning system; this information is summarized in Appendix C.

Cores were extracted from the borer, placed immediately in a VOC vial, and sealed. All tree core samples were shipped overnight on ice to Test America, Inc. for analysis of 1,4-dioxane by EPA Method 8270 selective ion monitoring (SIM) via methylene chloride extraction. Details on phytoscreening are available in the USGS field sampling plan (Appendix C).

All concentrations of 1,4-dioxane detected in tree core samples were flagged with "J" qualifier, because the 1,4-dioxane concentration in each sample was approximate, and below the contract required quantitation limit (CRQL). Therefore, phytoscreening was not selected as a full-scale investigative technology.

Real-Time Sensing Technology: A Time Critical Removal Action (TCRA) was performed from November 2011 through September 2012 (Figure 3-6); elevated VOC (such as benzene), SVOCs, pesticides, and metal concentrations were detected. Therefore, this area was selected for the field testing using direct-push sensing technologies, including a membrane interface probe (MIP), hydraulic profiling tool (HPT), and electrical conductivity (EC) or MiHPT® (combining all three) screening, to determine their effectiveness and implementability in a full-scale investigation.

In February 2013, five locations (TB-01 through 05, shown in Figure 3-6) were tested with MiHPT® by Columbia Technologies, LLC. Continuous data-logging was generated and produced readings/data for concentration, hydraulic conductivity, and gross stratigraphy throughout the depth of the boring. Groundwater samples were collected from these boring locations via a direct-push sampling method, and were analyzed by the Contract Laboratory Program (CLP) laboratories for VOCs, SVOCs, pesticides, total metals, and total petroleum hydrocarbons as gasoline-range organics/diesel-range organics (GRO/DRO). Water quality parameters such as pH, specific conductivity, temperature, turbidity, DO, and ORP were also logged.

The MiHPT® probe could not provide real-time data due to interference below the ground surface of the landfill. In addition, the ability of MiHPT® to detect a primary risk driver (i.e., 1,4-dioxane) was uncertain. Therefore, this technology was not selected as a full-scale investigative technology. Due to difficulties encountered during the MiHPT® work and poor data quality, EPA determined the resultant data were not usable; therefore, additional groundwater and soil samples were not collected for comparison to MiHPT® results.

3.3.3 On-Site Mobile Laboratory and Field Office

To provide rapid analytical results for field decision-making, groundwater samples were analyzed for primary risk drivers by an EPA mobile laboratory during screening-level plume delineation. Appendix F-3 provides the temporary boring sample results. An on-site laboratory equipped with gas chromatography/mass spectrometry (GC/MS) and graphite furnace atomic absorption (GFAA) was set up in a trailer on-site. The GC/MS was operated in the SIM mode and water samples were extracted by solid phase extraction (SPE) for the analysis of 1,4-dioxane. The GFAA was used to analyze arsenic in groundwater samples after the digestion process. The GC/MS was used with a purge and trap method to analyze TCE in groundwater samples.

A field office was established within a cargo van. Analytical data and field decisions were conferred via an established virtual private network (VPN), allowing team members to stay up to date on field activities.

3.4 SCREENING-LEVEL PLUME DELINEATION

The investigative area was initially determined based on the groundwater plumes projected by a baseline CSM, and divided into 10 Decision Units (DUs). However, during the decision-making process, the number of DUs was expanded further to include DUs-11 through 14, as shown in Figure 3-7.

Project screening levels (PSLs) used to delineate the plume and make decisions in the field were the lowest value among the screening criteria discussed in Section 3.2.1, but close to or above the quantitation limits that the ERT on-site laboratory could provide. Accordingly, the PSLs selected for 1,4-dioxane and TCE were the EPA RSLs for tap water (EPA, 2017), while the PSL selected for arsenic was the BTAG freshwater screening benchmark (EPA, 2006). The PSLs used are summarized below:

FIELD ANALYTES	PROJECT QUANTITATION LIMIT GOAL (µg/L)	PSL (µg/L)
1,4-Dioxane	1*	0.67**
Arsenic	2.78	5
TCE	0.25	0.44

* The project quantitation limit goal or reporting limit (RL) for 1,4-dioxane was listed as 0.2 µg/L in the SAP. However, it was increased to 1 µg/L after performing QA/QC of the analytical method used in the ERT on-site mobile laboratory.

** Although the PSL for 1,4-dioxane is lower than its RL, it was considered suitable for field screening purposes due to its approximation to the RL. Note that EPA RSLs for tap water were updated on May 2016 for 1,4-dioxane (0.46 µg/L) and TCE (0.28 µg/L).

Additional analytes such as VOCs, SVOCs, metals, and PCBs were analyzed in sample collected from certain areas (e.g., DUs-12 and 13) to identify other sources of contamination feeding into the plume. The analytical data generated by the ERT on-site mobile laboratory were intended to be used solely for evaluating sampling locations for additional borings, the need for off-sets, boring depths, and construction design of new monitoring wells. The analytical data collected from CLP laboratories were used to determine the nature and extent of impacted groundwater, and to perform human health and ecological risk assessments.

3.4.1 <u>Shallow Aquifer Assessment</u>

To delineate the plume in shallow aquifer using screening levels, Environmental Field Service, Inc. (EFS) used a Geoprobe® 7822D track-mounted drill rig to perform direct-push borings throughout the area shown in Figure 3-7 in April-September 2013. Two-inch boreholes were drilled approximately 100 feet apart along the edges of the shallow plumes in DU-4 as projected by a baseline CSM; borings were extended to formation refusal, which was considered the top of the saprolite (defined as a decomposed rock rich in clay, representing deep weathering of the bedrock surface that remains in its original place). Borehole locations were recorded via a Trimble hand-held GPS unit. A portable hand-held photoionization detector (PID) and flame ionization detector (FID) were used during boring to screen for the presence of VOCs and methane. Soil cores were collected and reviewed to determine the approximate water-bearing zones throughout the depth of each boring.

A groundwater grab sample was collected from each water-bearing zone encountered while boring using a retractable screen sampling tool (a.k.a., Screen Point 16 [SP16] or SP22) and a peristaltic pump after purging for 10 minutes. These samples were analyzed daily for 1,4-dioxane, arsenic, and TCE using the ERT on-site mobile laboratory. Upon completion of sampling, boreholes were abandoned and filled with the soil cuttings and/or bentonite. Boreholes located in roadways were filled with cold patch asphalt.

Off-set borings were drilled incrementally (100 feet from the initial boring location, perpendicular to the plume line outward from the landfill, but no more than 150 feet of spacing between any two borings) until non-detect or below PSLs were reported. Analytical data were compiled daily and entered into a database along with GPS coordinates of the sampling locations. Off-set locations were determined from updated plume maps reviewed by the project team. Field decisions were made using project decision rules and decision-logic diagrams for 1,4-dioxane, arsenic, and TCE in the shallow aquifer, as shown in Figures 3-8, 3-9, and 3-10, respectively.

A total of 175 temporary boreholes were drilled and 194 groundwater samples were collected to delineate the plume during the shallow aquifer assessment. Boring locations are shown in Figure 3-7, and their analytical results are included in Appendix F-3.

3.4.2 <u>Deep Aquifer Assessment</u>

To determine the extent of contamination in deep aquifer at the site, Sonic Drilling Services, Inc. drilled seven borings (DB-1 through DB-7) in the saprolite and bedrock in July-October 2013 via a rotary sonic drilling method with four-by-six-inch core-barrel diameter and outer casing diameter tooling. Boring locations are shown in Figure 3-7. Appendix D-1 contains detailed boring logs, including lithology, depth to water-bearing zones, and wastes present (if any). Each boring location was selected based on respective criteria, as summarized below:

- Borings DB-1 and DB-3 were selected based on their proximity to historical creek channels (Figure 1-3) and existing deep wells MW-16D and MW-15D, which exhibited elevated concentrations of contaminants.

- Boring DB-2 was selected as a contamination source location, and to evaluate potential deep-aquifer impacts to the creek.

- Boring DB-4 was selected as a mid-point between borings DB-1 and DB-7. This location was selected to evaluate potential vertical migration of VOCs in the “hot spot” area.

- Boring DB-5 was selected as a background location.

- Borings DB-6 and DB-7 were selected as downgradient locations for the landfill to help determine the fate and transport within the deep aquifer in the general direction of groundwater flow.

While the OU-3 SAP (Tetra Tech, 2013a) indicated 12 deep bedrock borings would be installed, the intent was to begin with initial borings DB-1 through DB-7 as shown in Figure 3-7, and then drill more as needed to delineate the extent of the deep groundwater plume outside of the landfill boundary. Based on the initial deep boring results, EPA determined the bedrock plume boundary had been sufficiently delineated and eliminated the drilling of more wells.

Borings were advanced until the final targeted depth was reached, or until the boring reached a depth of 300 feet bgs. Four-inch continuous cores were extracted using the drill head or a wireline winch, and were reviewed to determine fracture locations. Using a submersible pump connected to the packer, groundwater samples were collected from each fracture intervals encountered, and were analyzed for 1,4-dioxane, arsenic, and TCE by the ERT on-site mobile laboratory. A total of 26 groundwater samples were collected for field decision-making. Appendix F-3 includes the deep boring groundwater results.

The casing remained in the formation until a well was set or the hole grouted after geophysics had been performed. A borehole geophysical investigation for borings DB-1 through DB-7 was conducted between August 2, 2013 and October 1, 2013 to determine water-bearing fracture zones and their structural orientation. The geophysical data from the deep boreholes provided information regarding the depth and vertical extent of fractures, the azimuth and dip of the fractures, and their relation to the local bedding characteristics (Appendix D-2). Decision logic diagrams used to make field decisions for 1,4-dioxane, arsenic, and TCE in the deep aquifer are shown in Figures 3-11, 3-12, and 3-13, respectively.

The borehole geophysical logging program included natural gamma ray, electrical resistivity, temperature, caliper diameter, vertical flow rate (using a heat-pulse flowmeter) and compensated sonic measurements along with an acoustic televiewer (ATV) to record high-resolution images of each borehole. The ATV images were used to rank fracture/foliation continuity and fracture aperture based on four categories (1 to 4). The larger the category number, the most significant the fracture within the borehole.

The geophysical logs indicated there were numerous fractures and foliation features throughout the boreholes. Prominent Category 4 water-bearing fractures or joints were noted at the following depths:

- DB-1: Two each at 112 and 200.3 ft bgs.
- DB-2: Eight each at 125.1. 126-131, 136,4, 183-184, 187-190, 239-244, 274.9, and 287-289 ft bgs.
- DB-3: Not logged using ATV due to sediment build-up on logging instruments.
- DB-4: Four each at 59, 76, 92.3, and 126.5 ft bgs.
- DB-5: Seven each at 47, 56.8, 59.5, 74.8, 92.5, 114, and 116-119 ft bgs.
- DB-6: Eight each at 26.4, 27.5, 41.9, 56.6, 84.5, 89.5, 134, and 136.3 ft bgs.
- DB-7: One at 104 ft bgs.

Geophysical data were then used to design the well construction, including screened intervals for single wells or nested well pairs.

3.5 CREEK ASSESSMENT

An assessment was performed to determine if contaminated groundwater (mixed with leachate) was discharging from the landfill to the creeks, and to determine approximate discharging locations (and volume if possible). This study involved an investigation of the creek using infrared videography and remote-sensing technology to find leachate discharge points, and to determine appropriate pore water sampling locations for site-related contaminants. In addition, surficial geophysics was performed to look for fracturing that might act as a conduit for contaminant transport underneath the creek channel.

As part of this assessment, pore water samples were also collected and submitted to CLP laboratories at key locations in Darby and Cobbs Creeks for analysis 1,4-dioxane, SVOCs, metals, pesticides, and PCB congeners. These compounds were selected based on their presence at the site, and the nature of their persistence in the pore water. PCB congeners were sampled in pore water collected adjacent to the landfill area, where the remnants of a historical stream channel were discovered during the TCRA performed from November 2011 through September 2012. Because this channel appears to have discharged to the Darby Creek alignment, and PCB congeners had been discovered in the TCRA area, it was determined that PCB congeners would be a good indicator for determining discharge from the landfill.

3.5.1 <u>Infrared Seep Detection</u>

Groundwater discharge (seep) locations along the western bank of the landfill were identified during initial site reconnaissance; however, further investigation was necessary to locate other areas of groundwater/surface water interaction indicating possible transport of groundwater contaminants into the adjacent creeks. To accomplish this task, remote-sensing technologies employing a radio-controlled boat equipped with a conductivity sensor and an infrared thermometer were performed by USGS in March 2013 (Appendix E).

Thermal-imaging technology detects temperature differences between groundwater and surface water to locate seeps. Groundwater is typically warmer than surface water, during the winter and early spring months, and the difference in temperature provides a thermal signature detectable by infrared sensing devices. Initial site reconnaissance also showed seeps could be detected using the specific conductivity (conductance) of the water, because landfill leachate has a high conductivity. Seasonal differences in seeps were not noted during the OU-3 RI.

USGS provided a radio-controlled boat (approximately 1.5×2-feet in size) that was equipped with a conductivity sensor with an accuracy of 5% between 0.44 to 7.0 mS/cm (mmho/cm), and an infrared thermometer with an accuracy of ±0.2 ^{o}C between -10 to 65 ^{o}C. Temperature differences of two or more degrees indicate a possible seep. The boat was also equipped with a GPS and a data logger. The data logger took geographically referenced measurements every second. Real-time data from the data logger were recorded via a Bluetooth connection with a laptop computer.

Figure 3-14 depicts the survey conducted in the morning during low tide in Darby and Cobbs Creeks; to foster the greatest temperature difference between creek surface water and the seeps. The seeps were all located below the high tide line. The entire stretch of the creeks adjacent to the site was part of the survey, beginning north of the site in Cobbs Creek and extending south to Darby Creek at the 84th Street bridge. Several passes were made on each section of the creek to measure water temperature and specific conductivity. As detections were made by the boat, the handheld forward-looking infrared (FLIR) camera was used to confirm measurements. In extremely shallow or rapidly flowing portions of the creeks floating the boat was challenging, the handheld FLIR camera was used to sense temperatures.

To identify deviations from the mean, data from locations below the confluence of Darby and Cobbs Creeks were collected prior to a precipitation event (on March 4 and 5, 2013), while data from locations above the confluence were collected after the precipitation event (on March 13, 2013).

3.5.2 Surficial Geophysics

A survey of direct current (DC) resistivity, employing the methodology reported by Degnan and Brayton (2010) and Degnan and Harte (2013), was performed by USGS in March 2013 (Appendix E). This surficial geophysical survey was designed to locate fracture zones, and to determine fracture occurrence near the areas of possible groundwater/surface water interaction at and near Darby and Cobbs Creeks. Therefore, this survey helped to characterize subsurface features possibly important to determine the fate and transport of contaminants. Under ambient groundwater conditions, clay typically has the lowest resistivity response, followed by sand and gravel. In addition, saturated sand or gravel is generally less resistive than unsaturated sand or gravel (Zohdy and others, 1974; Kearey and Brooks, 1991). However, this order of resistivity is not absolute. For example, if the pore water in sand or gravel is altered by conductive groundwater (often due to the presence of contaminants), sand or gravel may appear less resistive than clay because of the water's elevated specific conductance.

DC resistivity data were collected from eight linear transects (arrays) along the creek channel adjacent to the landfill perpendicular to the creek (Figure 3-15). Each transect consisted of 23 to 48 electrodes. Transect locations were chosen to facilitate possible length of line without interference from buried conductive features (such as metal pipes). The locations were recorded with a Trimble GPS unit, and the local elevation was measured by leveling with existing monitoring wells having established reference elevations. Data collection at each transect required the following steps:

- Equipment deployment – Brush was cleared along the entire array. A linear array of steel stakes pounded into the ground, and each stake was attached to a cable that provided electrical current.

- Data collection – An electrical connection was tested for each electrode. A series of programs were run to provide electrical current and measure electrical response at each electrode. During this time, GPS location and surveyed elevation data were collected.

- Equipment breakdown –The array was disconnected, cleaned, repacked, and moved to another location.

Dipole-dipole and Schlumberger array (Zohdy and others, 1974) were used for survey configurations, and reverse dipole-dipole and reciprocal Schlumberger surveys were used for quality check. After removing electromagnetic anomalies possibly due to buried metallic landfill waste (e.g., scrap metal, vehicle frames, etc.) within and near the creek, DC-resistivity data were processed using RES2DINV Version 3.55 (Loke, 1999) to produce inverted resistivity sections.

A frequency-domain electromagnetic (FDEM) survey was also performed by USGS using the Geophex GEM-2 Plus, a portable multi-frequency electromagnetic sensor. FDEM involves generating an electromagnetic field that induces current in the earth, which in turn causes the subsurface to create a magnetic field. By measuring this magnetic field, subsurface properties and features can be deduced. Before and after each survey, a common base station was measured to evaluate the shift in instrument response with time. Data collection and processing methods used in this survey were similar to those described in Abraham and others (2006). Total conductivity measurements were calculated using WinGEM Version 3.0.0.14 (Geophex, Ltd.). More detailed information can be found in Appendix E.

3.5.3 Pore Water Specific Conductance Measurements

A pore-water specific conductance survey was performed by USGS in July and August 2013 during low tide conditions (Figure 3-15). The specific conductance of pore water beneath the stream bed was measured using a six-foot long portable piezometer coupled with a flow-through conductivity probe (Campbell Scientific Inc.). The piezometer was constructed of 1.2-cm stainless steel pipe with a 1×2-cm screened opening at the bottom of the probe. The top of the screened opening was sealed with epoxy, except for a piece of 0.3-cm (inside diameter [I.D.]) tubing. The tubing was connected to a Campbell Scientific CS547A water conductivity and temperature probe attached to the top of the piezometer. The probe CS547A was operated with a Campbell Scientific CR1000 data logger. Measurements were taken using a 60-mL syringe, by drawing 120 mL of pore water through the tubing and probe to ensure the equipment had been thoroughly rinsed. After rinsing, an additional 60 mL of pore water was drawn through the tubing and probe to take a measurement.

In addition to temperature and specific conductance, sample depth and GPS location were also recorded. Measurements of specific conductance were made in both surface water and pore water, approximately 60 cm below land surface (bls) (roughly 2 feet) and 120 cm bls (roughly 4 feet), respectively. Surface water measurements were collected using a WTW Tetracon 350 conductivity probe and meter (Xylem, Inc.) Periodically, comparisons were made between the two probes, and no significant differences between the two probes (by Student’s t-test with $n=21$, $p=0.98$) were noted. Each meter was calibrated daily. Detailed information regarding pore-water conductance is provided in Appendix E.

The USGS pore water specific conductance assessment revealed a large area of high conductance upstream of well MW-06 at both 2 feet and 4 feet bls (USGS, 2015). Figure 3-16 displays the maximum conductivity results for Darby Creek; Figures 3-17 and 3-18 present the measurements for the 2-foot and 4-foot depths, respectively. At some locations, the deeper reading could not be obtained due to stream characteristics. Elevated levels were also noted closer to the 84th Street Bridge crossing Darby Creek, possibly from an historical stream channel. In general, conductivity was higher in 4-foot measurements as compared to the 2-foot readings. The median 2-foot reading was 908 µS/cm, while the median 4-foot reading was 1,405 µS/cm. Well MW-06 was located near the western edge of the landfill adjacent to the creek, and exhibited elevated contaminant levels during the OU-1 RI. This well also had one of the highest water-level elevations at the site.

The USGS pore water measurements indicated conductance increased in water downstream of the confluence with Cobbs and Darby Creeks; the highest reading was 8,010 µS/cm. Near MW-06, two surface water measurements from Darby Creek were collected, one at the top of the water column, (which read 473 µS/cm); and one directly above the stream bottom (which read 830 µS/cm). These measurements suggested possible upward flow. However, differences in conductivity measurements throughout the USGS study may have been partly attributable to different days of sampling in relation to precipitation events.

3.5.4 <u>Pore Water Sampling</u>

Locations for pore water sampling were determined based on thermal imaging, direct measurements of specific conductivity, and temperature observed during the initial site recon. Stream conductivity results from the initial recon (as discussed in Section 3.3.1) were integrated with USGS pore water measurements to identify pore water sampling locations. As shown in Figure 3-2, leachate seep areas were noted near stations ST-1, ST-2, ST-3, ST-11, and ST-12 during the initial recon.

Pore water was initially sampled at the 12 sampling stations along the creek bank above the water surface in May 2013 (Figure 3-19). Pore water samples were collected using a short piece of slotted polyvinyl chloride (PVC) pipe driven into the bank to a depth that would allow water to freely flow through the PVC. After one week, samples of flowing water were collected from the PVC pipe and analyzed for SVOCs, total metals (including mercury), PCB congeners (4 locations only), pesticides, and 1,4-dioxane. Water quality parameters such as color, pH, specific conductivity, temperature, DO, and ORP were also recorded.

Additional pore water sampling was performed in September 2013. A driven-screen tool and a peristaltic pump were used to collect samples from six transects along the creek bank, each with 2-3 sampling stations across the creek. Pore water samples were analyzed for SVOCs, total metals (including mercury and boron), cyanide, PCB congeners (select locations only), pesticides, 1,4-dioxane, as well as dioxins and furans (select locations only). Pore water samples for PCB congener and dioxin/furan analyses were collected only in locations along the southern reach of Darby Creek, where a historical stream channel was located.

Although dissolved metals concentrations are more representative of bioavailability, pore water samples collected in May and September 2013 were not analyzed for dissolved metals. Therefore, additional pore water sampling was conducted in February 2016. A driven-screen tool and a peristaltic pump were used to collect samples from nine selected sampling stations used during the previous two sampling rounds (Figure 3-19). These samples were tested for dissolved and total metals only.

3.5.5 Sediment Sampling

As described in the SAP, sampling of sediment was only planned if extraordinary situations, such as evidence of sheen or seep discharge, were encountered. These situations did not occur and, therefore, no sediment samples were collected during the RI.

3.6 GROUNDWATER MONITORING

The current monitoring network is comprised of 65 wells, including 37 new locations installed during the OU-3 RI. The new wells were installed based on the sampling results from the temporary shallow and deep borings (Figure 3-1). These wells and the 28 existing wells installed in the center and perimeter of the landfill during the OU-1 RI were located along the edge of the screening-level plume (described in Section 3.4) to monitor long-term groundwater quality and define the extent of impacted groundwater at the site. The new wells were installed during OU-3 RI based on reviewing the sample results for temporary shallow and deep borings (Appendix F-3) along with other supporting information (e.g., borehole geophysical logging results).

In some cases, groundwater results from temporary borings differed from subsequent sampling results from the new wells. Several factors may have contributed to these differences, including the weighting scheme used by ERT to average depth-specific samples, temporal variability, analytical instruments used, and sample collection procedures.

3.6.1 Well Construction

Well construction (for both shallow and deep wells) was based on hydrogeologic conditions encountered in nearby borings. The final selection for the depth, construction methods, and number of intervals was made per the Figure 3-20 decision logic diagram, and after technical discussion with EPA. After well installation was complete, the vertical and horizontal coordinates for each of the newly installed wells were surveyed by a Pennsylvania Professional Licensed Surveyor (PLS). Complete lithologic logs and well construction specifications are included in Appendices D-1 and D-3.

Shallow Wells: Monitoring wells were constructed during February and March 2014 using direct push technology (i.e., GeoProbe®). The Pennsylvania One Call system was notified of the well location, and each location was surveyed for subsurface utilities by a licensed surveyor prior to drilling. Figure 3-1 shows the locations of the 27 wells (MW-24, MW-25, MW-26S/D, MW-27, MW-28, MW-29, MW-30, MW-31, MW-32, MW-33, MW-34S/D, MW-35, MW-36, MW-37, MW-38, MW-39, MW-40, MW-41S/D, MW-42, MW-43, MW-44, MW-45, MW-46, and MW-47) installed.

Well pairs MW-26S/D, MW-34S/D, and MW-41S/D were installed as couplets to evaluate water quality changes associated with depths and vertical hydraulic gradients (wells with suffix “S” refer to the shallower well of a well pair, and those with suffix “D” refer to the deeper well.) The location for well MW-47 had not been sampled previously, but was selected for well installation if well MW-32 was abandoned during future property development.

Wells were constructed with 1.5-inch schedule-40 PVC casing with five-foot pre-packed screen. Well-screen interval depths were selected based on temporary borehole sampling depths (Section 3.4.1).

Deep Wells: Based on the analytical results of groundwater samples and visual observations in the field, five boring locations were selected for the installation of new deep aquifer monitoring wells. A total of 10 new bedrock wells MW-19, MW-20S/I/D, MW-21S/D, MW-22, and MW-23S/I/D (wells with suffix “I” refer to the intermediate deep well of a well triplet) were installed at the boreholes DB-4, DB-2, DB-6, DB-7, and DB-5, respectively (Figure 3-7). Complete lithologic logs and well construction specifications are also provided in Appendix D.

Three wells MW-23S/I/D were installed in the area (DB-5) predicted to be outside the radius of influence of the plume to provide background data. All deep wells were constructed within water-bearing fracture zones with two-inch schedule-40 PVC casing and 10-foot screen intervals. Two wells were installed in a single boring at borehole DB-2, and a separate boring was drilled for the third well. Three wells were installed within the same borehole at borehole DB-5. A bentonite seal was placed between the wells that were installed within the same borehole.

Groundwater samples from boreholes DB-1 and DB-3 did not exhibit concentrations of primary risk drivers greater than their respective PSLs, and borehole DB-3 caved in at 40 feet bgs when drilling tools were removed from the boring. Therefore, new wells were not installed at these two boring locations. Although groundwater samples from DB-2 did not exhibited concentrations of primary risk drivers greater than their respective PSLs, new wells were installed to monitor other contaminants possibly existing in groundwater beneath the Southern Industrial Area of the landfill.

3.6.2 Well Completion

Monitoring wells were completed using either stick-up or flush mounts, depending on their locations. For stick-up wells, the four-inch steel casing was set between two and three feet above the ground surface. A 2×2×0.5-foot concrete pad was poured around the casing. The concrete pad was sloped to promote drainage away from the well. Steel casings had a removable steel lid with a lock, while the PVC casing inside the steel casing had a removable water-tight pressure cap.

For flush-mounted wells, a manhole sleeve was installed around the PVC casing, and set in a 2×2×0.5-foot concrete pad. A bolted manhole cover was installed on top of the manhole sleeve. The concrete pad was slightly elevated at the manhole cover, and sloped away from the well, to prevent surface water from running into the well. The PVC casing inside the manhole had a removable water-tight pressure cap.

3.6.3 Well Development

After construction of the wells was completed, depth to water was measured to determine the standing water column in each monitoring well. Well development was performed to clear suspended sediment in the gravel pack and well casing generated during well construction. Airlift/surging and/or a surge blocking technique was used to develop bedrock monitoring wells, while a peristaltic pump was used to develop overburden monitoring wells. The wells were developed until the discharge water was relatively free of sand or other fine material, and indicated an approximate neutral pH. All extracted purge water was containerized and transferred to a frac tank that was staged on-site, and disposed of at an appropriate off-site facility, as described in Section 3.8.

3.6.4 Cleanup and Restoration of Field Activity Locations

Reasonable efforts were made to minimize all soil and mud deposited on public and private roadways during drilling activities. Gross accumulation of soil/mud was removed from vehicles before they left work locations, and accumulated soil or mud was swept or shoveled from roadways when necessary. At the conclusion of the work at each boring location, all equipment, tools, material, and supplies were removed, and the site was cleaned and cleared of all debris generated by field activities.

Areas disturbed by drilling were restored to original conditions as nearly as practicable. A tractor-mounted tiller, aerator, and hand tools were used to remove ruts and level high and low points. After the surface was completed to grade, the restored area was seeded with the grass seed mixture requested by the City of Philadelphia. Detailed before and after photographs were taken of each boring or well installation location.

3.6.5 Groundwater Sampling and Analysis

Groundwater sampling was originally planned to be performed on a quarterly basis. After the first round of groundwater sampling in March and April 2014, Tetra Tech and EPA evaluated the results, and decided to perform the subsequent groundwater sampling events on a semi-annual basis (wet and dry seasons), instead of on a quarterly basis.

A network of 65 monitoring wells (37 newly installed and 28 existing wells) was sampled at the site. Locations of the wells are depicted in Figure 3-1. A summary of all existing and newly installed monitoring wells is provided in Table 3-5. The groundwater samples were collected from the newly constructed and existing wells, as follows: 10 new bedrock wells (MW-19, MW-20S/I/D, MW-21S/D, MW-22, and MW-23S/I/D); 27 new overburden wells (MW-24, MW-25, MW-26S/D, MW-27, MW-28, MW-29, MW-30, MW-31, MW-32, MW-33, MW-34S/D, MW-35, MW-36, MW-37, MW-38, MW-39, MW-40, MW-41S/D, MW-42, MW-43, MW-44, MW-45, MW-46, and MW-47); 7 existing bedrock wells (MW-13I/D, MW-14D, MW-15D, MW-16D, MW-17D, and MW-18D); and 20 existing overburden wells (MW-01S/D, MW-02, MW-03, MW-04, MW-05S/D, MW-06, MW-07S/D, MW-08, MW-09, MW-11, MW-12, MW-13S, MW-14S, MW-15S, MW-16S, MW-17S, and MW-18S).

All wells were sampled using the low-flow sampling techniques in accordance with the EPA Region 3 Recommended Procedure for Low-Flow Purging and Sampling of Groundwater Monitoring Wells, Bulletin No. QAD023, June 16, 1999. Dedicated tubing was used at each well to prevent cross-contamination. The depth to groundwater was measured in each well prior to purging. Wells that became dry after purging were left to recover overnight and sampled within 24 hours of purging. Water was purged from each well using a Geopump™ peristaltic pump or a Grundfos Redi-Flo® pump. Water quality parameters (i.e., DO, ORP, pH, specific conductivity, turbidity, and temperature) were monitored with an In-Situ® Troll 9500 water quality instrument or YSI 556 multi-parameter water quality meter. Groundwater samples were collected after these water quality parameters and the water level in the well had been stabilized, indicating that the water pumped was being drawn from the aquifer.

Together with QC samples including trip blanks, rinse blanks, temperature blanks, blind duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples, groundwater samples were shipped to laboratories for the following analyses:

- Target compound list (TCL) for VOCs.
- TCL for SVOCs including PAHs and 1,4-dioxane.
- TCL for pesticides.
- Target analyte list (TAL) for metals (total/dissolved) and cyanide.
- Boron.
- PCB congeners.
- Dioxins and furans.
- Anions (e.g., nitrite, nitrate, and sulfate).
- Dissolved gases (methane and acetylene).
- Perfluorinated alkyl acids [e.g., perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and other perfluorinated compounds (PFCs)].

The first round of groundwater sampling was conducted in March and April 2014. Samples were collected from 37 newly installed monitoring wells and 27 existing wells. MW-10 was not sampled due to an obstruction in that well. First round samples were analyzed for TCL VOCs, TCL SVOCs, PAHs, pesticides, TAL metals (total/dissolved), cyanide, boron, PCBs, dioxins and furans, and methane.

The second round of groundwater sampling was conducted in November and December 2014. Samples were collected from 36 new monitoring wells and 27 existing wells. Wells MW-45 and MW-10 were not sampled since they were either dry or obstructed. Second round samples were analyzed for TCL VOCs, TCL SVOCs, PAHs, pesticides, TAL metals (total/dissolved), cyanide, boron, PCBs, dioxins and furans, anions, methane, and perfluorinated alkyl acids.

The third round of groundwater sampling was conducted in July 2015. Samples were collected from 36 new monitoring wells and 27 existing wells. MW-45 and MW-10 were not sampled for reasons similar to the second round. Third round samples were analyzed for TCL VOCs, TCL SVOCs, PAHs, pesticides, TAL metals (total/dissolved), cyanide, dioxins and furans, anions, methane, acetylene, perfluorooctanoic acid, and perfluorooctanesulfonic acid.

The fourth round of groundwater sampling was conducted in April 2016. Samples were collected from 14 monitoring wells and analyzed for TCL VOCs. Samples were also collected from 32 monitoring wells and analyzed for anions and/or dissolved gases.

In some cases, the groundwater sampling and analysis program deviated from the OU-3 SAP (Tetra Tech, 2013a). These deviations were an integral part of the dynamic work strategy used during RI field work. EPA directed modifications to the program as newer information was generated and reviewed. For example, boron and PFAS compound analyses were added since they were thought to possibly be present at the site. Some groundwater sampling rounds involved a shorter list of analytical parameters if previous results documented the nature and extent of a specific contaminant (or class of substances) had been adequately characterized or delineated.

EPA later determined well MW-10 had an obstruction for years. Well MW-45 was consistently dry during multiple sampling events. The lack of data from these wells does not materially affect the conclusions of the OU-3 RI since data from other wells both within and outside the landfill boundary were available.

3.6.6 Water-Level Measurements

Three rounds of groundwater-level measurements were collected at study area in March 2014, December 2014, and July 2015 to provide hydraulic head data for piezometric elevations and groundwater contour maps. A fourth round of measurements only for the shallow aquifer was also conducted in April 2016. The condition of wells was also assessed during these rounds. Elevation measurements were obtained during a day of no precipitation, and at least 48 hours after the conclusion of any precipitation event. Static water levels were measured in all available wells using an electronic water-level indicator, and were recorded to the nearest 0.01 foot. Groundwater level data and monitoring well conditions are provided in Tables 3-3a, 3-3b, 3-3c, and 3-3d. Groundwater elevation contour maps were constructed for the water elevations collected in July 2015. The July 2015 elevations were the most complete set of water-level measurements collected during the RI. Figures 3-21 through 3-24 show groundwater contours and flow directions for the shallow (overburden) aquifer during all four rounds. Figures 3-25 through 3-27 display groundwater contours and flow directions for the deep (bedrock) aquifer.

Groundwater flow directions have likely not significantly changed since investigations began at the site. EPA plans to measure elevations again at the start of the OU-3 FS.

3.6.7 Groundwater Quality Parameters

Temperature, specific conductivity, pH, ORP, and DO were measured for groundwater samples collected from the screened intervals of each monitoring well in March 2014, December 2014, July 2015, and April 2016 (Tables 3-4a, 3-4b, 3-4c, and 3-4d).

The specific conductivity of a solution is a measure of its ability to conduct a current, and is a property attributable to the ions in the solution; conductivity increases as ion concentrations increases. Specific conductivity generally reflects the impacts of highly mobile, dissolved mineral salts such as chloride ions that are normally present in landfill leachate. Elevated specific conductivity levels may indicate the presence of leachate in groundwater or highly contaminated groundwater. High specific conductivity (>2,000 μS/cm) was observed in monitoring wells MW-03, MW-04, MW-05S/D, MW-06, MW-07S/D, MW-08, MW-11, MW-12, MW-13D, MW-14S, MW-16S, MW-25, MW-28, MW-36, MW-37, MW-38, and MW-41D. In general, high levels of specific conductivity were detected in monitoring wells located in the landfill and its eastern boundary to the Eastwick neighborhood. The highest average specific conductivity was detected in monitoring well MW-13D (7,254 μS/cm) within the screen interval of 120 and 130 feet bgs. However, two other shallow wells (MW-13S/I) in the same location exhibited much lower average specific conductivity (1,033 and 788 μS/cm, respectively). It is not clear whether deep groundwater near MW-13D is being impacted by leachate, or if another source (e.g., naturally-occurring minerals) is contributing to the high conductivity exhibited there.

The pH of groundwater is an indication of the intensity of its prevailing buffer system, and affects species ionization. The pH measured in groundwater samples from most monitoring wells was between 6.0 and

7.5. Three background location wells, including MW-17S/D and MW-18S, exhibited slightly acidic pH, and groundwater samples from monitoring wells MW-13I/D and MW-14D indicated extremely alkaline conditions (pH>10), which were discussed in Section 3.3.1.

The ORP measurements indicates that oxidizing or reducing conditions are present in the aquifer. Groundwater ORP values for all monitoring wells located in landfill area remained characteristic of a reducing environment (i.e., negative ORP). Groundwater ORP values for most of shallow (overburden) monitoring wells located outside the historical landfill boundary remained characteristic of an oxidizing environment (i.e., positive ORP). Based on the data collected in July 2015, DO values were low (< 0.75 mg/L) in all monitoring wells except the following eight wells: MW-11 (1.85 mg/L), MW-13D (0.96 mg/L), MW-14D (2.80 mg/L), MW-17S (1.74 mg/L), MW-20S (2.63 mg/L), MW-34D (1.28 mg/L), MW-39 (2.89 mg/L), and MW-45 (3.36 mg/L).

3.7 SAMPLE DESIGNATIONS

The sample designation scheme developed for the RI activities is as follows:

SITE NAME - MATRIX – DECISION UNIT - STATION - DEPTH - DATE

- SITE NAME: Site name abbreviated as “LDCA".

- MATRIX: Matrix abbreviation (GW- groundwater and PW – pore water).

- DECISION UNIT: Appropriate decision unit (DU) with two-digit identifier; no dash was used in the decision unit designation and zero was used as a place holder for locations numbered 1 through 9.

- STATION: Alphanumeric sample station (location) identifier; no dash was used in the station designation and zero was used as a place holder for locations numbered 1 through 9.

- DEPTH: Used only for screening-level groundwater samples to indicate sampling depth intervals in feet bgs.

- DATE: Sampling dates in the format of YYYYMMDD.

EXAMPLES:

1. A screening-level groundwater sample collected at 15-20 ft bgs in the shallow boring SS-147 located in DU-12 on August 21, 2013 would be designated as LDCA-GW-DU12-SS147-1520-20130821.

2. A groundwater sample collected at monitoring well MW-15D located within DU-6 on March 5, 2014 would be designated as LDCA-GW-DU06-MW15D-20140305.

3. A pore water sample collected at stream station LD-103 on May 2, 2014 would be designated as LDCA-PW-LD103-20140502.

3.8 INVESTIGATION-DERIVED WASTE CHARACTERIZATION AND DISPOSAL

The following investigation-derived wastes (IDW) were generated during OU-3 RI activities:

- Drill cuttings during borehole drilling of new monitoring wells.
- Water during borehole drilling, and well construction and development.
- Purge water during long-term groundwater monitoring.
- Water during sampling equipment decontamination.
- General trash, including all used personnel protective clothing and disposable supply.

All drill cuttings, purge water, and water generated during drilling, development, and equipment decontamination were containerized, characterized, and disposed of off-site as appropriate. To manage IDW properly, a frac tank and a roll-off dumpster were staged on-site. General trash including all used personnel protective clothing and disposable equipment, as well as general trash, was disposed of as municipal solid waste. Groundwater pumped from the wells within the landfill during long-term monitoring was discharged directly to the ground surface. However, visually contaminated (stained or oily) groundwater was containerized, evaluated, and disposed of appropriately.

4.0 NATURE AND EXTENT OF CONTAMINATION

This section presents the data collected during the OU-3 RI, and discusses the nature and extent of contaminated groundwater at the site and its impact to nearby creeks and aquifers. The information herein assists to assess risk to human health and the environment, and to select the appropriate remedial response, if appropriate. Details on sampling results, including specific contaminants detected and their locations, are discussed in the following subsections. The complete analytical data sets are provided in Appendix F.

Section 4.1 discusses the results of groundwater sampling for the landfill area itself and for wells located outside of the landfill boundary. Appendix F-1 summarizes the groundwater analytical results. Section 4.2 discusses pore water sample results, which are provided in Appendix F-2. The purpose of pore water sampling was to generate evidence of groundwater (mixed with leachate) discharging from the landfill to nearby creeks. Section 4.3 provides a comparison of groundwater and pore water information for selected locations.

4.1 GROUNDWATER EVALUATION

A groundwater investigation was part of the OU-1 RI, and summarized in the RI report (Tetra Tech, 2011) and its addendum (Tetra Tech, 2012b). The OU-1 RI found groundwater quality had been impacted by organic and inorganic contaminants originating from wastes in Clearview Landfill. However, several significant data gaps existed that limited EPA's ability to fully define the nature and extent of contaminated groundwater at the site, and its impact to nearby creeks and aquifers.

The OU-3 RI was conducted to better define vertical and lateral extent of contamination in groundwater at the landfill area, and to delineate impacted groundwater migrating outside the historic landfill boundary within the coastal plain and bedrock aquifers. Four groundwater sampling events were performed for OU-3 RI with a network of 65 wells (37 newly installed and 28 existing wells), as shown in Figure 3-1.

The wells located inside the historic landfill boundary were used to evaluate groundwater contamination at landfill area, while those located outside the historic landfill boundary were used to evaluate the coastal plain (shallow) aquifer and the bedrock (deep) aquifer outside landfill boundary. Tables 4-1 through 4-20 summarize analytical data obtained during the four sampling events.

For discussion purposes, EPA slightly modified the comparison of groundwater concentrations to screening criteria as described in the SAP to better reflect the nature and extent of contamination; therefore, EPA Region 3 RSLs for tap water and/or MCLs of the SDWA were compared to the concentrations of contaminants detected in groundwater samples. Groundwater concentrations exceeding RSLs or MCLs are highlighted in the tables and figures. Some figures only reflect the comparison to their respective MCLs for arsenic and trichloroethene (TCE). For arsenic, the MCL (10 µg/L) was selected for comparison since all samples exceeded its RSL of 0.052 µg/L and using the MCL helped better differentiate portions of the shallow and deep plumes with elevated arsenic concentrations. Also, one deep well (MW-23I), which was considered to represent background conditions, contained arsenic at 10 µg/L. For TCE, the MCL (5 µg/L) was chosen for comparison since only a few groundwater samples contained TCE greater than its RSL of 0.28 µg/L and all these samples were from wells outside the landfill boundary.

For pore water samples, the EPA Region 3 Biological Technical Assistance Group (BTAG) freshwater screening benchmarks (EPA, 2006) were also used for the comparison. Appendix F includes the relevant analytical data such that other comparisons can be made. The OU-3 FS will present the criteria and actual performance cleanup goals for groundwater.

Figures 4-1 through 4-15 show concentrations of the selected analytes, such as arsenic, VOCs, 1,4-dioxane, PFOA, and PFOS, and dissolved gases, which represent the distribution of pollutant groups that were commonly found in groundwater samples. The contaminant levels detected in wells MW-25, MW-26, and MW-33 may not be attributable to the landfill itself given the locations of these wells and the potential for other suspected sources of contamination to exist near them.

4.1.1 Landfill Area Groundwater

4.1.1.1 Inorganics

Tables 4-1a, 4-1b, and 4-1c display the inorganic substances detected in groundwater within the historic landfill boundary. The following inorganics were found in groundwater samples at least once above screening values:

Total Metals

- Aluminum
- Antimony
- Arsenic
- Barium
- Cadmium
- Chromium
- Cobalt
- Copper
- Iron
- Lead
- Manganese
- Mercury
- Nickel
- Silver

- Thallium
- Vanadium
- Zinc

Dissolved Metals

- Antimony
- Arsenic
- Barium
- Chromium
- Cobalt
- Iron
- Lead
- Manganese
- Mercury

Others

- Boron
- Cyanide

Seventeen metals were detected above RSLs in unfiltered (for total metal) groundwater samples at the landfill area. Nine metals (antimony, arsenic, barium, chromium, cobalt, iron, lead, manganese, and mercury) were detected above their respective RSLs in both filtered (for dissolved metal) and unfiltered groundwater samples at Landfill Area. Of these, arsenic, barium, chromium, iron, and manganese were found more frequently and at higher concentrations than others. Figure 4-1 shows the sample locations and concentrations of arsenic at the landfill area. The fourth sampling event did not include inorganic analysis.

Round 1 Inorganics: Arsenic was detected at concentrations exceeding its RSL value (0.052 µg/L) in most wells with total levels ranging from 0.56J µg/L at MW-20D-DUP to 51.9 µg/L at MW-11, and dissolved concentrations varying from 1.1 µg/L at MW-12 to 26.7 µg/L at MW-07S located near the confluence of Darby and Cobbs Creeks on the western edge of the landfill. Total and/or dissolved arsenic concentrations greater than its MCL (10 µg/L) were detected in four shallow wells (MW-02, MW-07S, MW-11, and MW-37).

Elevated iron concentrations exceeding its RSL (1,400 µg/L) were found in most wells. The total iron results ranged from 489J µg/L at MW-20S to 157,000 µg/L at MW-11, and dissolved iron varied from 1,280 µg/L at MW-20I to 76,200 µg/L at MW-34D. Chromium was detected at concentrations exceeding its RSL value (0.035 µg/L) in all wells. Total chromium results ranged from 1.6J µg/L at MW-01S to 399 µg/L at MW-11, and dissolved chromium concentrations varied from 1.4J µg/L at MW-09 to 30.2 µg/L at MW-04.

Total and/or dissolved antimony, barium, cadmium, chromium, lead, and mercury were also detected at MW-11 at levels above their MCLs. Boron was found in all wells located in the landfill area. Total boron results varied from 27.3 µg/L at MW-20S to 4,080 µg/L at MW-05S, and dissolved boron concentrations ranged from 24.1 µg/L at MW-20S to 3,950 µg/L at MW-05S. Both total boron and dissolved boron were reported in 14 of 21 samples exceeding its RSL (400 µg/L). Cyanide was found in 8 of 21 samples, ranging from 3.9J to 367 µg/L. All cyanide results were above its RSL (0.15 µg/L). Cyanide was detected above its MCL (200 µg/L) in well MW-11 only.

Round 2 Inorganics: Arsenic was reported at concentrations exceeding its RSL value in most wells. Total arsenic levels varied from 0.91 µg/L at MW-01D to 72.1 µg/L at MW-01S, and dissolved arsenic results ranged from 1.1 µg/L at MW-04 to 34.9 µg/L at MW-07S. Total and/or dissolved arsenic concentrations greater than its MCL were found in eight shallow wells (MW-01S, MW-02, MW-03, MW-07S, MW-09, MW-11, MW-36, and MW-37).

Elevated iron concentrations exceeding its RSL were reported in most wells. Total iron levels ranged from 281 µg/L at MW-20S to 201,000 µg/L at MW-11, and dissolved iron results varied from 2,470 µg/L at MW-20D to 102,000 µg/L at MW-05D.

Chromium was reported at levels exceeding its RSL value in all wells. The total chromium results ranged from 0.51J µg/L at MW-20S to 183 µg/L at MW-11, and dissolved chromium levels varied from 0.64J µg/L at MW-34D to 18.8 µg/L at MW-06. Total antimony, barium, cadmium, chromium, lead, and mercury were also detected in MW-11 with concentrations greater than their respective MCLs. Total beryllium and thallium levels were found in MW-20D exceeding their MCLs. Total boron was detected in 18 of 21 samples, ranging from 20.5J µg/L at MW-20S to 3,920 µg/L at MW-05S. Thirteen samples were contained boron above its RSL.

Cyanide was detected in 10 of 21 samples, ranging from 1.6J µg/L to 227 µg/L. All concentrations were above its RSL. Cyanide was reported above its MCL in MW-05D only.

Round 3 Inorganics: Arsenic concentrations exceeding the RSL were found in most wells. Total arsenic results ranged from 0.45 µg/L at MW-01D to 43.4 µg/L at MW-01S, and dissolved arsenic levels varied from 0.44 µg/L at MW-01D to 40.9 µg/L at MW-01S. Total and/or dissolved arsenic concentrations greater than its MCL were reported in six shallow wells (MW-01S, MW-02, MW-07S, MW-09, MW-11, and MW-36). Elevated iron concentrations exceeding its RSL were found in most wells with total iron levels ranging from 1,050J µg/L at MW-20S to 92,800J µg/L at MW-34D, and dissolved iron results varying from 16.5 µg/L at MW-20S to 85,000 µg/L at MW-34D.

Chromium was detected at concentrations exceeding the RSL in all wells. Total chromium results ranged from 1.7J µg/L at MW-07D to 85.9 µg/L at MW-11, and dissolved chromium results varied from 0.25J µg/L at MW-20S to 15.7 µg/L at MW-37. Total antimony, barium, and lead were also reported in MW-11 at levels exceeding MCLs. Total lead was found exceeding its MCL of 15 µg/L, and cyanide was detected in 13 of 18 samples, ranging from 2.5J to 200 µg/L. All cyanide results were above the RSL. Cyanide was found above the MCL in MW-11 only.

4.1.1.2 VOCs

Tables 4-2a, 4-2b, and 4-2c present VOCs detected in landfill area groundwater samples. Figure 4-2 shows sample locations and concentrations of VOCs exceeding screening values in the landfill area groundwater. The contaminants listed below were detected at least once above their respective RSLs for tap water:

- 1,4-Dichlorobenzene
- Chlorobenzene
- Benzene
- TCE

In general, all VOCs analyzed for landfill area groundwater samples were detected at relatively low concentrations. Four VOCs were reported at concentrations exceeding their respective RSLs, including 1,4-dichlorobenzene, benzene, chlorobenzene, and TCE. However, all results were less than MCLs. The most frequently detected VOC with concentrations greater than its RSL (7.8 µg/L) was chlorobenzene.

4.1.1.3 SVOCs

Tables 4-3a through 4-3d present SVOCs, including PAHs and 1,4-dioxane, reported in landfill area groundwater samples and compare the results to screening values. Figure 4-3 shows the groundwater sample locations and concentrations of 1,4-dioxane in landfill area groundwater. The contaminants listed below were reported in at least once above their respective RSLs for tap water and/or MCLs for tap water:

- 1,4-Dioxane
- Benzo(a)pyrene
- Benzo(k) fluoranthene
- Dibenz(a,h)anthracene
- Indeno(1,2,3-c,d)pyrene
- Pentachlorophenol (PCP)
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Bis(2-ethylhexyl)phthalate
- Dibenzofuran
- Naphthalene

A total of eleven SVOCs were detected in samples at concentrations exceeding their respective RSLs in at least one well. Of these SVOCs, 1,4-dioxane was reported in most wells. The primary SVOCs with levels greater than RSLs were PAHs, including benzo(a)anthracene, benzo(a)pyrene (BAP), benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-C,D)pyrene and naphthalene. PAHs were detected above their respective RSLs in well samples MW-01S, MW-11, MW-02, MW-04, MW-05S, MW-06, MW-07S, MW-07D, MW-12, MW-20S, MW-20I, and MW-37.

Round 1 SVOCs: 1,4-Dioxane was reported in 19 of 21 samples, ranging from 2.3 µg/L at MW-07S to 110 µg/L at MW-01D. All concentrations were above its RSL (0.46 µg/L). Bis(2-ethylhexyl)phthalate was found in wells MW-01D, MW-11, and MW-20D above its MCL (6 µg/L).

Round 2 SVOCs: 1,4-Dioxane was found in 20 of 21 samples with all concentrations exceeding the RSL and varying from 1.7J µg/L at MW-01S to 220J µg/L at MW-01D.

Round 3 SVOCs: 1,4-Dioxane was detected in all 19 samples at levels above the RSL ranging from 1.3 µg/L at MW-20I to 150 µg/L at MW-11. PCP was detected in 6 of 17 samples, ranging from 0.11J to 0.61 µg/L. All PCP concentrations were above its RSL (0.041 µg/L) and less than its MCL (1 µg/L).

4.1.1.4 Pesticides

Tables 4-4a, 4-4b, and 4-4c present pesticides detected in landfill area groundwater samples and compare the results to screening values. The following substances were found at least once above their respective RSLs for tap water:

- 4,4'-DDD
- 4,4'-DDE
- Aldrin
- Dieldrin
- Beta BHC
- Gamma BHC
- Heptachlor
- Heptachlor epoxide

Round 1 Pesticides: Aldrin, beta-BHC, dieldrin, and gamma-BHC were reported at levels above respective RSLs. Of these, beta-BHC was detected in 6 of the 21 samples, ranging from 0.022J to 0.081J µg/L. Samples from MW-03, MW-07S, MW-09, MW-12 and MW-37 contained beta-BHC levels above its RSL (0.025 µg/L).

Round 2 Pesticides: Aldrin, 4,4'-DDE, dieldrin, heptachlor and heptachlor epoxide were detected at concentrations greater than RSLs. Of these, aldrin was reported in 19 of the 21 samples, ranging from 0.00018J to 0.0047J µg/L. Samples from MW-03, MW-04, MW-05S, MW-07D, MW-11, MW-12, MW-34S, and MW-37 contained aldrin above its RSL (0.00092 µg/L).

Round 3 Pesticides: Only two samples contained pesticide concentrations above RSLs. 4,4'-DDD was reported in MW-01S at 0.0334 µg/L above its RSL of 0.032 µg/L, while 4,4'-DDE was found in MW-11 at 0.0554 µg/L above its RSL of 0.046 µg/L.

4.1.1.5 PCBs

Tables 4-5a and 4-5b display PCBs detected in landfill area groundwater samples. The PCB congeners listed below were detected at least once above their respective RSLs for tap water:

- PCB-77
- PCB-81
- PCB-105
- PCB-114
- PCB-118
- PCB-123
- PCB-156/157
- PCB-167
- PCB-189

Round 1 PCBs: PCB-77, PCB-81, PCB-105, PCB-114, PCB-118, PCB-123, PCB-156/157, PCB-167, and PCB-189 were reported in MW-11 at levels above RSLs. Total PCB congeners were found in MW-04, MW-05S, MW-07S, MW-07D, MW-11, MW-12, MW-20D, and MW-34S exceeding its RSL of 44,000 picograms/liter (pg/L). Sample MW-11 contained total PCBs at 180 µg/L. Toxic equivalents (TEQ) of dioxin-like PCBs (in terms of 2,3,7,8-tetrachlorodibenzo-p-dioxin [TCDD]) were detected in MW-04 (0.15 pg/L) and MW-11 (112 pg/L) exceeding its RSL of 0.12 pg/L.

Round 2 PCBs: PCB-77, PCB-105, PCB-118, PCB-156/157, PCB-167, and PCB-189 were contained in MW-11 above RSLs. Total PCB congeners were reported for MW-04, MW-07S, MW-07D, MW-11, MW-12, and MW-34S exceeding the RSL. Well MW-11 contained total PCBs at 19 µg/L. TEQ of dioxin-like PCBs was reported in MW-11 (9.8 pg/L) that was greater than the RSL.

4.1.1.6 Dioxins and Furans

Tables 4-6a, 4-6b, and 4-6c show dioxins detected in landfill area groundwater samples. Analytical results of dioxins and furans were presented as TEQ for which the concentrations of polychlorinated dibenzidioxins (PCDDs or dioxins) and polychlorinated dibenzofurans (PCDFs or furans) were equated to that of TCDD, based on the toxic equivalency factor (TEF) of individual congeners.

Round 1 Dioxins and Furans: Total TEQ concentrations of all dioxins and furans in wells MW-04 (2.8 pg/L), MW-05D (0.65 pg/L), and MW-11 (4,100 pg/L) exceeded the TCDD RSL (0.12 pg/L). Of these wells, total TEQ of dioxins and furans in MW-11 also exceeded the MCL (30 pg/L) of TCDD.

Round 2 Dioxins and Furans: Total TEQ levels in samples from MW-01S, MW-01D, MW-02, MW-03, MW-04, MW-05S, MW-05D, MW-6, MW-7D, MW-11, MW-12, MW-20I, MW-34S, and MW-37 were greater than the RSL for TCDD. Of these wells, total TEQ concentrations in MW-11 exceeded the MCL for TCDD.

The rationale for the change in frequency of dioxin/furan results exceeding the TCDD RSL between the first and second rounds was not precisely known but may be related to the time of the year when samples were collected. Round 1 groundwater sampling was performed in March/April 2014, while Round 2 was done in November/December 2014. The effects of temperature, precipitation, and other factors may have influenced the concentrations for dioxins and furans.

Round 3 Dioxins and Furans: During this round, only two samples were collected from wells MW-34S and MW-34D for dioxins and furans analyses. Total TEQ levels in MW-34S (0.309 pg/L) exceeded the TCDD RSL.

4.1.1.7 Perfluorinated Compounds (PFCs)

Table 4-7a displays perfluorinated compounds (PFCs) found in landfill area samples. Perfluorooctanoic acid (PFOA) was reported in 19 of the 20 samples, ranging from 0.026J µg/L at MW-34D to 0.56 µg/L at MW-05S. Eighteen groundwater samples contained PFOA above its screening value (0.04 µg/L). EPA has established a health advisory level at 0.07 µg/L for the combined concentrations of PFOA and PFOS. Perfluorooctanesulfonic acid (PFOS) was detected in 14 of the 20 samples, ranging from 0.02J µg/L at MW-01D to 1.2 µg/L at MW-01S. Thirteen samples detected PFOS concentrations above its screening value (also 0.04 µg/L). Figure 4-4 reflects sample locations and concentrations of PFOA, PFOS, and the combined concentrations of PFOA and PFOS in the landfill area.

4.1.1.8 Anions and Dissolved Gases

Tables 4-7a, 4-7b, and 4-7c present anions and dissolved gases detected in landfill area groundwater samples. Figure 4-5 displays sample locations and concentrations of acetylene and methane in the landfill area. Anions (nitrate, nitrite, and sulfate) and dissolved gases (methane and acetylene) are natural attenuation parameters, and were used to evaluate the suitability of geochemical conditions in the aquifers for biodegradation, as well as to determine if natural bioremediation was occurring.

Round 2 Anions and Dissolved Gases: Methane was detected in all 20 samples, ranging from 0.027 to 394 mg/L. Nitrate was found in 6 of 20 samples at concentrations of 0.15 mg/L. Nitrite was detected in 6 of 20 samples, ranging from 0.05 to 2.5 mg/L. Sulfate was reported in 15 of 20 samples with levels varying from 0.5 to 80.2 mg/L.

Round 3 Anions and Dissolved Gases: Methane was detected in all 18 samples, ranging from 0.02 mg/L to 21 mg/L. Acetylene was detected in all 11 samples, ranging from 0.066 mg/L to 8.58 mg/L. Sulfate was found in 10 of 18 samples, ranging from 0.52 mg/L to 49.1 mg/L.

Round 4 Anions and Dissolved Gases: Methane was reported in all 16 samples, ranging from 0.051 mg/L to 20 mg/L. Acetylene was found in all 16 samples, ranging from 53.6 µg/L to 81.4 µg/L. Sulfate was detected in MW-01D (5.78 µg/L), MW-02 (9.8 µg/L), MW-07D (5.72 µg/L), and MW-09 (2.24 µg/L).

4.1.2 Shallow (Overburden) Groundwater - Outside Landfill Boundary

4.1.2.1 Inorganics in Shallow Groundwater

Tables 4-8a, 4-8b, and 4-8c present the inorganic chemicals detected in outside landfill boundary shallow groundwater samples. The following inorganics were reported at least once above their respective RSLs for tap water and/or MCLs for tap water:

Total Metals

- Aluminum
- Antimony
- Arsenic
- Barium
- Cadmium
- Chromium
- Cobalt
- Copper
- Iron
- Lead
- Manganese
- Mercury
- Vanadium
- Silver
- Zinc

Dissolved Metals

- Antimony
- Arsenic
- Barium
- Cadmium
- Chromium
- Cobalt
- Iron
- Lead
- Mercury
- Manganese
- Selenium
- Thallium

Others

- Boron
- Cyanide

Fifteen metals were detected above RSLs in unfiltered (for total metal) shallow groundwater samples at outside landfill boundary. Ten metals (antimony, arsenic, barium, cadmium, chromium, cobalt, iron, lead, manganese, and mercury) were detected above their respective RSLs in both filtered (for dissolved metal) and unfiltered samples outside the landfill boundary. Of these, arsenic, barium, chromium, cobalt, iron, and manganese were more frequently detected at higher concentrations than others. Elevated concentrations of metals were detected at well MW-25. Figure 4-6 shows the concentrations of arsenic detected outside the landfill boundary and sampling locations.

Round 1 Inorganics: Arsenic was detected at concentrations exceeding its RSL in most wells. Total arsenic results varied from 0.16J µg/L at MW-13S to 54.3 µg/L at MW-41S, and dissolved arsenic ranged from 2.1 µg/L at MW-16S to 58.8 µg/L at MW-41S. Total and/or dissolved arsenic concentrations greater than its MCL were detected at five shallow wells, including MW-08, MW-14S, MW-15S, MW-27, and MW-41S. Elevated iron concentrations exceeding the RSL were detected in 10 of 31 samples. Total iron levels ranged from 70 µg/L at MW-17S to 62,400 µg/L at MW-41S, and dissolved iron varied from 57.1 µg/L at MW-40 to 64,500 µg/L at MW-41S. Total chromium was found exceeding its RSL in 21 of 31 samples, ranging from 2.3J µg/L at MW-26S to 7.4J µg/L at MW-16S.

Dissolved chromium results exceeded its RSL value in 28 of 31 samples, ranging from 0.7J µg/L at MW-35 to 6.2J µg/L at MW-47. Total and/or dissolved lead concentrations greater than its MCL were reported for MW-08 and MW-26D. Boron was detected in all shallow wells located at outside landfill boundary. Total boron concentrations varied from 33.9 µg/L at MW-40 to 1,380 µg/L at MW-16S, and dissolved boron concentrations ranged from 33.1 µg/L at MW-17S to 1,600 µg/L at MW-16S. Both total boron and/or dissolved boron were detected in MW-15S, MW-16S, MW-25, MW-27, MW-28, MW-32, MW-38, MW-45, and MW-46 exceeding its RSL. Cyanide was reported in 10 of 31 samples, ranging from 0.91J µg/L at MW-41D to 3.3J µg/L at MW-14S. All cyanide concentrations were above the RSL, but below the MCL.

Round 2 Inorganics: Total arsenic was reported at concentrations exceeding its RSL in 18 of 30 samples, ranging from 0.12J µg/L at MW-17S to 51.3 µg/L at MW-15S. Dissolved arsenic was found at concentrations exceeding the RSL in 26 of 30 samples, ranging from 0.15J µg/L at MW-17S to 49.2 µg/L at MW-15S. Total and dissolved arsenic concentrations greater than its MCL were reported in four shallow wells (MW-14S, MW-15S, MW-26D, and MW-27). Total iron was detected in 17 of 30 samples, ranging from 132J µg/L at MW-46 to 53,400 µg/L at MW-15S. Dissolved iron was reported in 15 of 30 samples, ranging from 129J to 53,400 µg/L.

Total manganese was detected in all 30 samples, varying from 2.5J µg/L at MW-29 to 71,800 µg/L at MW-41D. Dissolved manganese was detected in 29 of 30 samples, ranging from 4.6 µg/L at MW-29 to 77,000 µg/L at MW-41D. Total lead was detected at 19.8 µg/L exceeding its MCL in MW-25. Total thallium was detected at concentration exceeding its MCL (2 µg/L) in MW-46. Total boron was reported in 25 of 30 shallow groundwater samples, ranging from 28.9J µg/L at MW-17S to 2,920 µg/L at MW-25. Seven samples contained boron above its RSL. Cyanide was detected in 2 of 30 samples; concentrations were above its RSL for MW-14S (1.1J µg/L) and MW-47 (1.3J µg/L).

Round 3 Inorganics: Arsenic was reported at concentrations exceeding the RSL in all wells. Total arsenic results ranged from 0.1 µg/L at MW-40 to 84.1 µg/L at MW-41S and dissolved arsenic varied from 0.089 to 57.3 µg/L. Total and/or dissolved arsenic concentrations greater than its MCL were detected in six shallow wells (MW-14S, MW-15S, MW-25, MW-26D, MW-27, and MW-41S). Elevated iron concentrations exceeding its RSL were found in most wells. Total iron levels ranged from 9.6J µg/L at MW-17S to 137,000J µg/L at MW-24 and dissolved iron varied from 2.8 µg/L at MW-39 to 129,000 µg/L at MW-24. Total chromium was detected at concentrations exceeding its RSL in 20 of 28 groundwater samples, ranging from 0.15J µg/L at MW-18S to 31.3 µg/L at MW-26D.

Dissolved chromium was detected at concentrations greater than the RSL in all 29 samples, ranging from 0.057J µg/L at MW-35 to 3 µg/L at MW-40. Total antimony, cadmium, and lead were found at concentrations exceeding their respective MCLs in MW-25. Total lead was also reported exceeding its MCL in MW-26D. Cyanide was detected in 1 of 5 samples. Cyanide was found at 16.8J µg/L in MW-41S only.

4.1.2.2 VOCs in Shallow Groundwater

Tables 4-9a through 4-9d summarize VOCs detected in shallow groundwater samples collected from outside the landfill boundary. Figure 4-7 displays shallow groundwater sample locations and concentrations of VOCs that exceeded screening values. The following contaminants were reported in groundwater samples at least once above their respective RSLs for tap water and/or MCLs for tap water:

- 1,2-Dichloroethane
- 1,4-Dichlorobenzene
- cis-1,2-Dichloroethene (DCE)
- m,p-Xylene
- Vinyl chloride
- 1,2-Dibromo-3-chloropropane
- 2-Hexanone
- Benzene
- Ethylbenzene
- TCE

In general, VOCs were not detected in groundwater samples as frequently as inorganics. They were also reported at relatively low concentrations. The VOC levels found in wells MW-25, MW-26, and MW-33 may not be attributable to the landfill given their locations and potential for other suspected sources of contamination to exist near them.

Round 1 VOCs: VOCs were reported at concentrations above screening levels in well MW-25 located at south of landfill, including benzene (3.1 µg/L), TCE (0.4J µg/L), and vinyl chloride (4.2 µg/L). TCE was also detected above its RSL of 0.28 µg/L in MW-38 (7.2 µg/L), MW-39 (0.58 µg/L), and MW-45 (1.4 µg/L). Vinyl chloride was also found above its RSL of 0.019 µg/L and MCL of 2 µg/L in MW-25 (4.2 µg/L) and MW-38 (3.7 µg/L). DCE was detected above its RSL of 3.6 µg/L in MW-38 (46 µg/L) and MW-45 (9.3 µg/L).

Round 2 VOCs: Benzene was detected at MW-25 at 5.9 µg/L above its RSL of 0.46 µg/L and MCL of 5 µg/L. TCE was reported above its RSL in MW-13S (4.5J µg/L), MW-38 (14 µg/L), and MW-33 (0.41J µg/L). Vinyl chloride was found above its RSL in MW-8 (0.25J µg/L), MW-13S (1.8J µg/L), MW-25 (1.8 µg/L), MW-26S (0.14J µg/L), MW-38 (2.2 µg/L), and MW-46 (0.2J µg/L). DCE was detected greater than its RSL in MW-13S (53 µg/L) and MW-38 (94 µg/L).

Round 3 VOCs: Benzene was found in MW-25 at concentration of 3.5 µg/L above its RSL, while TCE was detected greater than its RSL in MW-13S (5.6 µg/L), MW-38 (8.4 µg/L), and MW-39 (0.79J µg/L). DCE was reported above its RSL in MW-13S (12 µg/L) and MW-38 (42 µg/L). Vinyl chloride was detected above its RSL in MW-38 (2.8 µg/L) only.

Round 4 VOCs: VOCs were found above screening levels in MW-25 located at south of landfill, including benzene (5.8 µg/L), 1,4-dichlorobenzene (0.76 µg/L), 2-hexanone (5.6J µg/L), ethylbenzene (4.4J µg/L), and vinyl chloride (0.25J µg/L). TCE was reported above its RSL in MW-38 (6.2 µg/L) and MW-39 (0.86 µg/L). Vinyl chloride was detected greater than the RSL in MW-25 (0.25J µg/L) and MW-38 (0.4J µg/L). DCE was reported above its RSL in MW-38 (54J µg/L) and MW-39 (4.4J µg/L).

4.1.2.3 SVOCs in Shallow Groundwater

Tables 4-10a through 4-10e present SVOCs (including PAHs and 1,4-dioxane) detected outside the landfill boundary in shallow groundwater samples. Figure 4-8 reflects shallow groundwater sample locations and concentrations of 1,4-dioxane outside the landfill boundary. The contaminants listed below were detected at least once above their respective RSLs for tap water:

- 1,4-Dioxane
- Benzo(a)anthracene
- Benzo(a)pyrene
- Bis(2-chloroethyl)ether

- 2,6-Dinitrotoluene
- PCP
- 2-Methylnaphthalene
- Naphthalene

SVOCs were not commonly present in shallow samples collected outside the landfill boundary. Eight SVOCs were detected at concentrations exceeding their respective RSLs in at least one well. Of these SVOCs, 1,4-dioxane was the most frequently detected compound.

Round 1 SVOCs and 1,4-Dioxane: 1,4-Dioxane was reported in 15 of 33 samples, ranging from 2.6 µg/L at MW-42 to 260 µg/L at MW-41D. All concentrations were above the RSL. PCP was detected above its RSL in MW-25 (0.18 J µg/L) only. The PCP result for well MW-25 may not be related to the landfill itself.

Round 2 SVOCs and 1,4-Dioxane: 1,4-Dioxane was detected in 26 of 32 samples, ranging from 0.12J µg/L at MW-41S to 150 µg/L at MW-41D. The results for 22 of these samples were above the 1,4-dioxane RSL. Benzo(a)anthracene was detected above its RSL of 0.012 µg/L in MW-16S (0.02J µg/L) and MW-28 (0.034J µg/L). Naphthalene (5.2 µg/L) (RSL of 0.17 µg/L) and PCP (0.21J µg/L) were found above screening levels in MW-25.

The depth of well MW-41S, which was screened from 6.5 to 11.5 ft bgs, may not be truly representative of shallow groundwater quality as compared to “deeper” well MW-41D (screened from 27 to 32 ft bgs). Therefore, the difference in contaminant concentrations for this well pair are considered anomalous, particularly for 1,4-dioxane, arsenic, and iron.

Round 3 SVOCs and 1,4-Dioxane: 1,4-Dioxane was reported in 22 of 29 samples, ranging from 0.34J µg/L at MW-27 to 290 µg/L at MW-41D. The results for 21 of these samples were above its RSL. Naphthalene (8 µg/L) and benzo(a)pyrene (0.12J µg/L) were found above screening levels in MW-25. Trace levels of PCP were detected above its RSL in MW-16S (0.17J µg/L), MW-25 (0.24J µg/L), and MW-41S (0.094J µg/L). Benzo(a)anthracene (0.26 µg/L) and benzo(a)pyrene (0.073J µg/L) (RSL of 0.0034 µg/L) were reported above screening levels in MW-16S.

4.1.2.4 Pesticides and PCBs in Shallow Groundwater

Tables 4-11a, 4-11b, and 4-11c present pesticides reported outside the landfill boundary in shallow groundwater. The following pesticides were found at least once above tap water RSLs:

- Aldrin
- Dieldrin
- Heptachlor epoxide
- Beta-BHC
- Heptachlor

Tables 4-12a and 4-12b display PCBs detected in outside landfill boundary shallow groundwater samples PCBs were not frequently detected in these samples.

Round 1 Pesticides and PCBs: Beta-BHC was detected in 2 of 33 samples, ranging from 0.017J to 0.036J µg/L. Beta-BHC was reported only in MW-16S at 0.036J µg/L, which was above its RSL.

Only total PCB congeners were contained in MW-26S (210,000 pg/L) and MW-26D (60,000 pg/L) above its RSL. TEQ levels were all less than its RSL.

Round 2 Pesticides and PCBs: Aldrin, dieldrin, heptachlor, and Heptachlor epoxide were found at levels above RSLs. Of these, aldrin was detected in 23 of 30 samples, varying from 0.00015J to 0.0059J µg/L. Seven groundwater samples contained concentrations above the aldrin RSL. Dieldrin was found in 26 of 30 samples, ranging from 0.00019J to 0.042 µg/L. Nine groundwater samples contained dieldrin at concentrations above its RSL (1.8 µg/L).

Again, only total PCB congeners were detected in MW-26S (210,000 pg/L) above the RSL. The TEQ concentration was less than the RSL.

Round 3 Pesticides and PCBs: Only dieldrin was reported in 5 of 33 samples above its RSL, ranging from 0.017J to 0.036J µg/L. Samples were not tested for PCBs during Round 3.

4.1.2.5 Dioxins and Furans in Shallow Groundwater

Tables 4-13a and 4-13b summarize dioxins and furans found in shallow groundwater outside the landfill boundary. Dioxins were detected in several shallow samples.

Round 1 Dioxins and Furans: Total TEQ concentrations for all dioxins and furans in MW-15S (0.15 pg/L) exceeded the screening value for TCDD.

Round 2 Dioxins and Furans: Total TEQ for dioxins and furans in samples from MW-17S (0.449 pg/L), MW-24 (2.12 pg/L), MW-25 (0.151 pg/L), MW-26S (0.965 pg/L), MW-38 (1.45 pg/L), and MW-41D (1.55 pg/L) were greater than the screening value. All concentrations were less than the MCL for TCDD.

4.1.2.6 Perfluorinated Compounds in Shallow Groundwater

Tables 4-14a and 4-14b provide PFCs detected in shallow groundwater outside the landfill boundary. Samples were analyzed for PFCs during Rounds 2 and 3. Figure 4-9 reflects shallow groundwater sample locations and levels of PFOA, PFOS, and the combined concentrations of PFOA and PFOS outside the landfill.

Round 2 PFCs: PFOA was found in 27 of 29 samples, ranging from 0.012 J µg/L at MW-17S to 2 µg/L at MW-14S. Nineteen samples contained PFOA above its screening value. PFOS was reported in 20 of 29 samples, varying from 0.015 J µg/L at MW-33 to 0.42 µg/L at MW-08. Of these 19 samples, 12 samples contained PFOS above its screening value.

Round 3 PFCs: PFOA was detected in all 8 samples, ranging from 0.031 µg/L at MW-13S to 2.7 µg/L at MW-14S. Six samples contained PFOA above the screening value. PFOS was found in 7 of 8 samples, varying from 0.014J µg/L at MW-15S to 0.45 µg/L at MW-08. Five samples revealed PFOS levels above the screening value.

4.1.2.7 Anions and Dissolved Gases in Shallow Groundwater

Tables 4-14a, 4-14b, and 4-14c present anions and dissolved gases detected in shallow groundwater outside the landfill. Figure 4-10 displays sample locations and concentrations of acetylene and methane outside the landfill boundary. Samples were not tested for these substances during Round 1.

Round 2 Anions and Dissolved Gases: Methane was detected in 24 of 29 samples, ranging from 0.001 to 88.8 mg/L. Nitrate was reported in 17 of 29 samples, varying from 0.15 to 6.78 mg/L, while nitrite was found in 9 of 29 samples, ranging from 0.05 to 2.5 mg/L. Sulfate was detected in 28 of 29 samples with values varying from 0.765 to 138 mg/L.

Round 3 Anions and Dissolved Gases: Methane was found in 24 of 29 samples, ranging from 0.0009 to 24 mg/L. Acetylene was contained in all 14 samples, ranging from 55.5 to 2,730 µg/L. Nitrate was detected in 15 of 29 samples, ranging from 0.165 to 4.54 mg/L. Sulfate was reported in 27 of 29 samples with values varying from 1.51 to 143 mg/L.

Round 4 Anions and Dissolved Gases: Methane was reported in all eight wells, ranging from 0.23 to 15 mg/L, while acetylene was found in all wells between 57.4 and 68.7 µg/L. Acetylene concentrations were much lower than Round 3. Nitrate was detected in MW-13S (0.432 mg/L) and MW-14S (0.229 mg/L), while sulfate was contained in MW-13S (26.7 mg/L), MW-14S (53.7 mg/L), and MW-27 (44 mg/L).

4.1.3 Deep (Bedrock) Groundwater - Outside Landfill Boundary

4.1.3.1 Inorganics in Deep Groundwater

Tables 4-15a, 4-15b, and 4-15c provide the inorganics reported in deep (bedrock) groundwater samples collected outside the landfill boundary. The following inorganics were found in deep samples at least once above RSLs for tap water and/or MCLs for tap water:

Total Metals

- Aluminum
- Antimony
- Arsenic
- Barium
- Cadmium
- Chromium
- Cobalt
- Iron
- Manganese
- Mercury
- Vanadium

Dissolved Metals

- Antimony
- Arsenic
- Barium
- Chromium
- Cobalt
- Iron
- Mercury
- Manganese

Others

- Cyanide

Eleven metals were detected above RSLs in unfiltered (for total metal) deep groundwater samples at outside landfill boundary. Eight metals (antimony, arsenic, barium, chromium, cobalt, iron, manganese, and mercury) were detected above their respective RSLs in both filtered and unfiltered samples at outside landfill boundary. Figure 4-11 displays deep groundwater sample locations and concentrations of arsenic outside landfill boundary.

Round 1 Inorganics: Total arsenic was detected above its RSL in 8 of 16 samples, ranging from 0.18J µg/L at MW-13I to 7.8 µg/L at MW-23I (well cluster MW-23 was considered to represent background groundwater quality). Dissolved arsenic was reported above its RSL in MW-23S (3 µg/L) and MW-23I (6.2 µg/L). All results were less than the arsenic MCL. Total iron was detected in all 16 samples, ranging from 234J µg/L at MW-13I to 42,600J µg/L at MW-23I, while dissolved iron varied from 603 µg/L at MW-17D to 41,500 µg/L at MW-23S. Total chromium was found at levels greater than its RSL in 12 of 16 samples, ranging from 1.9J µg/L at MW-21D to 62.6 µg/L at MW-13D. Dissolved chromium levels exceeded its RSL in 13 of 14 samples, varying from 2J µg/L at MW-23D to 4.1J µg/L at MW-15D. Cyanide was detected above its RSL in MW-13I (0.9 J µg/L).

Round 2 Inorganics: Total arsenic was detected at concentrations exceeding its RSL in 10 of 16 samples, ranging from 0.097J µg/L at MW-17D to 10 µg/L at MW-23I. Dissolved arsenic was reported at levels exceeding the RSL in 12 of 16 samples with results varying from 0.16J µg/L at MW-17D to 5.2 µg/L at MW-23I. Total chromium was found at concentrations exceeding its RSL in 9 of 16 samples, varying from 0.017J µg/L at MW-16D to 28.7 µg/L at MW-13D, while dissolved chromium results were greater than the RSL in MW-13I (0.28J µg/L) and MW-22 (0.36J µg/L).

Total manganese was detected in 14 of 16 samples, ranging from 31 µg/L at MW-13D to 4,490 µg/L at MW-21Sl; dissolved manganese was reported in 15 of 16 samples with results varying from 0.082J µg/L at MW-13D to 4,800 µg/L at MW-21S. Cyanide was found above its RSL in MW-15D (1.6J µg/L) only.

Round 3 Inorganics: Total arsenic results exceeded its RSL in all 13 samples, ranging from 0.13 µg/L at MW-17D to 5.5 µg/L at MW-23 D. Dissolved arsenic levels were between 0.012 µg/L and 4 µg/L; all results were less than its MCL. Total chromium was reported at concentrations exceeding the RSL in 7 of 16 samples with results between 0.046J µg/L at MW-17D and 27.1 J µg/L at MW-23D. Dissolved chromium was found at levels greater than the RSL in all 14 samples, ranging from 0.041 µg/L at MW-15D to 25.3 µg/L at MW-13D. Total manganese was detected in 12 of 13 samples with results between 1.1J µg/L at MW-13D to 5,080 µg/L at MW-21S. Dissolved manganese was reported in 13 of 14 samples, varying from 0.076J µg/L at MW-13D to 4,630 µg/L at MW-21S. Cyanide was only found above its RSL in MW-16D (11.1J µg/L).

4.1.3.2 VOCs in Deep Groundwater

Tables 4-16a, 4-16b, 4-16c, and 4-16d present VOCs detected in outside landfill boundary deep groundwater samples and compare them to screening values. The positive detection ranges and respective detection frequencies were also provided. Figure 4-12 shows the deep groundwater sample locations and concentrations of VOCs that exceed screening values outside landfill boundary. The contaminants listed below were detected in groundwater samples at least once above their respective RSLs for tap water and/or MCLs for tap water:

- 1,1-Dichloroethane
- Benzene
- TCE
- Vinyl chloride
- 1,1-Dichloroethene
- Chloroform
- DCE

VOCs were detected above RSLs in MW-13I, MW-13D, and MW-19. All three wells were located south of the landfill.

Round 1 VOCs: TCE was detected above its RSL in MW-13D (2.5 µg/L), MW-13I (44 µg/L), and MW-19 (260 µg/L). DCE was reported greater than its RSL in MW-13D (100 µg/L), MW-13I (68 µg/L), and MW-19 (1,000 µg/L).

Round 2 VOCs: Benzene was reported at MW-19 at 0.88J µg/L above its RSL. 1,1-dichloroethane and 1,1-dichloroethene were detected at MW-19 with results of 3.7J µg/L and 7.3 µg/L, respectively. TCE was found at a level greater than the RSL in MW-13D (5.9 µg/L), MW-13I (53 µg/L), and MW-19 (420 µg/L). Vinyl chloride was reported above its RSL in MW-13D (0.69 µg/L), MW-13I (0.51J µg/L), and MW-19 (11 µg/L). DCE results were greater than the RSL in MW-13D (120 µg/L), MW-13I (85 µg/L), and MW-19 (1,800 µg/L).

Round 3 VOCs: Benzene was detected in MW-19 at 0.65 J µg/L above its RSL. TCE results were greater than the RSL in MW-13D (3.5 µg/L), MW-13I (59 µg/L), and MW-19 (330 µg/L). DCE results exceeded the RSL in the same three wells, including MW-13D (100 µg/L), MW-13I (84 µg/L), and MW-19 (1,500 µg/L). Vinyl chloride was reported above its RSL in MW-19 (8.5J µg/L).

Round 4 VOCs: Benzene was reported in MW-19 at 0.745 µg/L above its RSL. TCE, vinyl chloride, and DCE were detected above their RSLs in three wells. The TCE results were for MW-13D (3.7 µg/L), MW-13I (44 µg/L), and MW-19 (295 µg/L), while vinyl chloride concentrations were for MW-13D (0.92 µg/L), MW-13I (0.38 J µg/L), and MW-19 (9.7 µg/L). DCE was reported in MW-13D (120 µg/L), MW-13I (74J µg/L), and MW-19 (1,750 µg/L).

4.1.3.3 SVOCs in Deep Groundwater

Tables 4-17a through 4-17e present SVOCs found in outside landfill boundary deep groundwater samples. Figure 4-13 reflects sample locations and concentrations of 1,4-dioxane outside the landfill. The following substances were reported in samples at least once above RSLs for tap water and/or MCLs for tap water:

- 1,4-Dioxane
- Bis(2-ethylhexyl)phthalate
- Indeno(1,2,3-c,d)pyrene
- Benzo(a)pyrene
- Dibenz(a,h)anthracene
- Naphthalene

Several SVOCs were contained in samples MW-13I, MW-13D MW-16, MW-19, MW-21S, and MW-21D. 1,4-Dioxane was the most frequent compound detected.

Round 1 SVOCs: 1,4-Dioxane was found above its RSL in 3 of 14 samples, ranging from 7.3 µg/L at MW-13D to 22 µg/L at MW-22. Bis(2-ethylhexyl)phthalate was detected above its RSL of 5.6 µg/L in MW-13D (7 µg/L) only.

Round 2 SVOCs: 1,4-dioxane was reported in 10 of 16 samples, ranging from 0.044 J µg/L at MW-16D to 29 µg/L at MW-19. Five of these samples contained 1,4-dioxane at levels greater than the RSL. Dibenz(a,h)anthracene was detected above its RSL of 0.0034 µg/L in MW-16D (0.32J µg/L) and MW-21D (0.0057J µg/L). Naphthalene was reported above the screening level in MW-13D (0.36J µg/L), while indeno(1,2,3-c,d)pyrene was found above its screening level in MW-16D (0.39J µg/L).

Round 3 SVOCs: 1,4-Dioxane was detected in 5 of 14 samples, ranging from 0.24J µg/L at MW-17D to 32 µg/L at MW-19. Three of these samples contained 1,4-dioxane above the RSL. Benzo(a)pyrene results were reported above its screening level in MW-13D (0.077J µg/L).

4.1.3.4 Pesticides and PCBs in Deep Groundwater

Table 4-18 summarizes pesticides detected in deep groundwater samples obtained from outside the landfill boundary. Only dieldrin was reported in MW-14D at 2.24J µg/L above its RSL during Round 3. No pesticides or PCBs were detected above RSLs during Rounds 1 and 2 in deep groundwater.

4.1.3.5 Dioxins and Furans in Deep Groundwater

Table 4-19 provides dioxins and furans reported in deep samples from outside the landfill boundary. Dioxins were detected in several samples during Round 2, but not Round 1.

Round 1 Dioxins and Furans: Dioxins and furans were not contained in deep samples above screening values.

Round 2 Dioxins and Furans: Total TEQ results of all dioxins and furans in MW-13D (1.16 pg/L), MW-16D (6.1 pg/L), MW-18D (0.874 pg/L), MW-19 (1.9 pg/L), and MW-22 (0.218 pg/L) exceeded the screening value for TCDD. All concentrations were less than the MCL for TCDD.

4.1.3.6 Perfluorinated Compounds in Deep Groundwater

Tables 4-20a and 4-20b provide PFCs detected in deep samples collected outside the landfill. Figure 4-14 reflects deep groundwater sample locations and concentrations of PFOA, PFOS, and the combined concentrations of PFOA and PFOS outside the landfill boundary.

Round 2 PFCs: PFOA was detected above the RSL in MW-13I (0.044 µg/L), MW-19 (0.15J µg/L), and MW-23S (0.068 µg/L). Well MW-23S was considered to represent background groundwater quality. PFOS was only found above the screening value in MW-19 (0.14J µg/L).

Round 3 PFCs: PFOA was again reported above its screening value in MW-13I (0.049 µg/L).

4.1.3.7 Anions and Dissolved Gases in Deep Groundwater

Tables 4-20a, 4-20b, and 4-20c show anions and dissolved gases detected in deep samples from wells outside the landfill. Figure 4-15 displays sample locations and concentrations of dissolved gases acetylene and methane from outside the landfill boundary.

Round 2 Anions and Dissolved Gases: Methane was reported in 13 of 14 samples, ranging from 0.00172 to 0.557 mg/L. Nitrate was found in 3 of 13 samples with the same concentration of 0.15 mg/L, while nitrite was detected in 3 of 13 samples with values between 0.05 and 0.5 mg/L. Sulfate was reported in all 13 samples, varying from 2.7 to 101 mg/L.

Round 3 Anions and Dissolved Gases: Methane results were reported for 13 of 14 samples with values between 0.0021 and 0.54 mg/L. Acetylene was detected in all 8 samples, ranging from 43.8 µg/L to 71.9 µg/L. Sulfate was detected in 13 of 14 samples, ranging from 2.64 mg/L to 105 mg/L.

Round 4 Anions and Dissolved Gases: Methane was detected in selected wells MW-14D (1.3 µg/L) and MW-15D (12 µg/L). Acetylene was also found in wells MW-14D (79.8 µg/L) and MW-15D (74.5 µg/L). Sulfate was contained in five wells, including MW-13I (37.4 mg/L), MW-14D (54.6 mg/L), MW-21D (43.2 mg/L), and MW-21S (47.5 mg/L).

4.1.4 Groundwater Evaluation Summary

Sampling during the OU-3 RI indicated groundwater quality has been impacted by organic and inorganic contaminants originating from landfill wastes, from other sources not directly related to the landfill, as well as from potential sources and wastes not necessarily attributable to the site. Contaminants likely associated with the landfill include metals, VOCs, SVOCs, PAHs, pesticides, PCBs, dioxins/furans, and PFCs. Contaminated groundwater was detected beneath the landfill area, as well as in the coastal plain aquifer and bedrock aquifer outside the historical landfill boundary. In general, groundwater samples collected from within the landfill contained contaminants at higher concentrations than samples collected from outside the landfill boundary.

1,4-Dioxane, PFOA/PFOS, and arsenic were the most pervasive contaminants detected in the plume attributable to the site. 1,4-Dioxane is very mobile and was often found in samples collected at the edge of the plume. The areal distribution of 1,4-dioxane in shallow and deep aquifers based on July 2015 data (Round 3) are shown in Figures 4-16 and 4-17. This specific round was selected to display 1,4-dioxane results since it represented the most complete data set to evaluate. Figure 4-18 presents the distribution of the combined concentrations of PFOA and PFOS for the shallow aquifer. Samples collected from MW-11, located in the central part of the landfill, contained elevated concentrations of most contaminants; samples collected in Eastwick neighborhood revealed lower concentrations.

Figure 4-19 displays the pattern of contamination based on the highest arsenic concentrations detected in both shallow and deep wells during all rounds of groundwater RI sampling. Arsenic levels greater or equal to the MCL (10 µg/L) were generally found in wells within the landfill boundary. Only one deep well (MW-23I), considered to be a background well, contained arsenic at 10 µg/L.

The areal distribution of TCE based on April 2016 data (Round 4) is shown in Figures 4-20 and 4-21 for shallow and deep wells. Again, this round was chosen to portray TCE concentrations since it best reflected the most complete data set. The pattern of DCE contamination was similar to that of TCE; the DCE results are provided in Figures 4-7 and 4-12. DCE was not detected in wells within the landfill boundary.

Various inorganics were detected in shallow groundwater. The most frequently detected metals that exceeded their respective RSLs in both total and dissolved forms included antimony, arsenic, barium, chromium, cobalt, iron, lead, manganese, and mercury. Total and/or dissolved arsenic concentrations greater than its MCL were found beneath the landfill in eight shallow wells, (MW-01S, MW-02, MW-03, MW-07S, MW-09, MW-11, MW-36, and MW-37). Total and/or dissolved arsenic concentrations greater than the MCL were detected outside the landfill in seven shallow wells (MW-08, MW-14S, MW-15S, MW-25, MW-26D, MW-27, and MW-41S).

Groundwater concentrations of other inorganics exceeded MCLs in one or more wells, as indicated below:

- MW-04: Total barium.
- MW-05D: Cyanide.
- MW-11: Total and/or dissolved antimony, barium, cadmium, chromium, lead, mercury, and cyanide.
- MW-20D: Total lead, beryllium, and thallium.
- MW-08, MW-20S, and MW-26D: Total and/or dissolved lead.
- MW-23D: Total lead.
- MW-25: Total antimony, lead, and cadmium.
- MW-46: Total thallium.

For deeper groundwater outside the landfill, total arsenic was found at MW-23I equal to its MCL, while total lead (41.4 µg/L) was contained in well MW-23D at a concentration greater than its MCL (15 µg/L). No other metals were detected at concentrations above their MCLs in deep groundwater outside the landfill boundary. Wells MW-23I and MW-23D were representative of background groundwater quality.

VOCs were detected beneath the landfill at concentrations below MCLs. Some shallow and deep samples collected from wells south of landfill and outside the landfill contained TCE, DCE, 1,1-dichloroethene, and vinyl chloride at levels greater than MCLs, including:

- TCE: MW-13S, MW-13D, MW-13I, MW-19, and MW-38.
- Vinyl chloride: MW-25, MW-38, and MW-19.
- Benzene: MW-25.
- DCE: MW-13D, MW-13I, MW-38, and MW-19.
- 1,1-Dichloroethene: MW-19.

If TCE was used to identify the extent of the VOC plume, the plume would be roughly 400 feet wide at its widest point within an estimated length of 800 feet. The approximate depth of VOC contamination would be 100 feet bgs. The pattern of contamination for DCE would be similar to TCE since detections were reported for many of the same wells as shown in Figures 4-7 and 4-12.

1,4-dioxane was detected in most groundwater samples above its RSL. The highest concentration of 1,4-dioxane was found in well MW-41D (290 µg/L) near the eastern boundary of the landfill. The 1,4-dioxane plume originating at the landfill may represent the maximum extent of groundwater impacts associated with OU-3 (Figures 4-16 and 4-17). The 1,4-dioxane shallow plume may extend east to Penrose Plaza Shopping Center, and south to Korman Residential at International City Chalets; however, whether this entire pattern of contamination outside the landfill boundary can be attributable to the site is uncertain. Concentrations of 1,4-dioxane in shallow groundwater appeared to decrease east of the landfill, as evidenced by results for wells MW-42 (3.1 µg/L) and MW-46 (7.6 µg/L), before increasing at wells further to the east, including MW-28 (32 µg/L), MW-43 (9.6 µg/L), MW-32 (21 µg/L), and MW-47 (18 µg/L) (Figure 4-8). Commercial and industrial uses of the general area may account for some of these increases in 1,4-dioxane levels, and may be unrelated to Clearview Landfill.

Based on 1,4-dioxane exceedances of the RSL, the shallow plume appeared to be approximately 3,400 feet wide and about 5,400 feet long. The depth of 1,4-dioxane contamination may possibly extend to at least 250 feet bgs (i.e., the screened depth of well MW-20D) in two localized areas based on July 2015 sampling; however, most other deep wells did not contain 1,4-dioxane, as shown in Figure 4-17.

The primary SVOCs exceeding RSLs were PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, and naphthalene. PAHs exceeding RSLs were detected beneath the landfill in 12 wells (MW-01S, MW-11, MW-02, MW-04, MW-05S, MW-06, MW-07S, MW-07D, MW-12, MW-20S, MW-20I, and MW-37). Shallow groundwater samples collected from MW-16S, MW-28, MW-25, and MW-41S outside the landfill also contained RSL exceedances. PAH concentrations above RSLs were also reported for deep wells MW-13D, MW-16D, and MW-21D located outside the landfill.

Samples from 12 wells within the landfill boundary contained RSL exceedances of pesticides, including 4,4'-DDD, 4,4'-DDE, aldrin, beta-BHC, dieldrin, gamma-BHC, heptachlor, and heptachlor epoxide. RSL exceedances of aldrin, beta-BHC, dieldrin, heptachlor, and heptachlor epoxide were also detected in 13 shallow wells outside the landfill boundary.

Total PCB congeners exceeded the RSL in MW-4, MW-5S, MW-7S, MW-7D, MW-11, MW-12, MW-20D, and MW-34S within the landfill area. TEQ exceedances of the TEQ RSL (0.12 pg/L) were detected in MW-04 (0.15 pg/L) and MW-11 (112 pg/L). Total PCB congeners were detected in two wells (MW-26S and MW-26D) located outside the landfill at concentrations exceeding its RSL only.

Total TEQ for all dioxins and furans were detected in 14 wells within the landfill boundary at concentrations exceeding its RSL (0.12 pg/L for TCDD). Of these wells, only MW-11 also exceeded its MCL. Total dioxin and furan TEQ exceedances of the RSL were detected in shallow groundwater outside the landfill at MW-15S, MW-17S, MW-24, MW-25, MW-26S, MW-38, and MW-41D, but all concentrations were less than the MCL. Total dioxin and furan TEQ levels exceeding the RSL were also detected in five deep wells located outside the landfill, but all concentrations were less than the MCL.

PFOA and PFOS compounds were detected frequently above screening values. The combined concentrations of PFOA and PFOS were greater than EPA health advisory level throughout most of the study area. Most elevated concentrations of combined PFOA/PFOS were detected in groundwater beneath the landfill. Two shallow wells (MW-14S and MW-08) and two deep wells (MW-13I and MW-19) outside of the landfill also contained concentrations greater than the EPA health advisory level.

Metals, VOCs, 1,4-dioxane, PAHs, PFOA, PFOS, and dioxins were detected above respective screening values and/or MCLs in well MW-25 located within the Industrial Drive properties. By comparing concentrations of these constituents in MW-25 to concentrations in other wells located along the eastern bank of Darby Creek, the source of contamination in MW-25 may not be related to Clearview Landfill.

Figures 4-22 and 4-23 reflect the shallow and deep groundwater plumes with contaminant concentrations greater than MCLs, respectively. In the shallow plume, thallium was the only analyte exceeding its MCL (well MW-46) in December 2014. Barium in shallow well MW-26S (screened from 5-10 ft bgs), and both arsenic and lead in shallow well MW-26D (screened from 12-17 ft bgs) had concentrations greater than their respective MCLs. In the deep plume, samples from well cluster MW-23 west of the landfill showed several MCL exceedances for lead and arsenic. This well cluster was considered to represent background water quality. Due to the extent of the 1,4-dioxane and combined PFOA/PFOS plumes for which MCLs are not available for these compounds.

Benzene, vinyl chloride, antimony, lead, and cadmium were detected above their MCLs in shallow well MW-25. These results and the locations of the wells suggested sources of contamination other than Clearview Landfill, as shown in Figure 4-22.

In summary, the OU-3 RI adequately delineated the nature and extent of shallow and deep groundwater contamination attributable to the site with few exceptions. However, the following data limitations were acknowledged:

- The pattern of chlorobenzene and 1,4-dichlorobenzene in the uppermost portion of the shallow aquifer within the landfill boundary east of well MW-34S as shown in Figure 4-2.

- The extent of 1,4-dioxane contamination in the shallow aquifer outside the landfill boundary east of wells MW-32 and MW-47 and south of wells MW-33 and MW-44 as depicted in Figure 4-16.

- The pattern of contamination for PFAS compounds (e.g., PFOA and PFOS) in the shallow aquifer outside the landfill boundary primarily in the eastern plume area near wells MW-32 and MW-47 as well as northeast of wells MW-08 and MW-14S and south of well MW-27 as shown in Figure 4-18).

- The extent of arsenic contamination and possibly other co-located inorganics (e.g., cyanide) in the shallow aquifer outside the landfill boundary east of wells MW-09, MW-14S, and MW-15S as displayed in Figure 4-19.

EPA plans to address these data limitations for the shallow aquifer as part of future investigations or response actions at the site.

4.2 PORE WATER EVALUATION

Pore water sampling was conducted in May 2013, September 2013, and February 2016 (Figure 3-16). The May 2013 pore water samples were collected above stream water from 12 stations along the stream bank closest to the landfill. For the OU-3 RI, pore water was defined as water that surrounds the grains of sediment (i.e., pore spaces) and is influenced by both groundwater below it and surface water above it. The purpose of pore water sampling was to determine interactions between landfill groundwater and adjacent creeks. The interactions take place in three basic ways: creeks gain water from inflow of groundwater through the streambed (gaining stream), they lose water to groundwater by outflow through the streambed (losing stream), or they do both, gaining in some reaches and losing in other reaches. For groundwater to discharge into a stream channel, the altitude of the water table in the vicinity of the stream must be higher than the altitude of the creek water surface. Conversely, for surface water to seep to groundwater, the altitude of the water table near the stream must be lower than the altitude of the stream water surface.

Pore water samples were collected during OU-3 RI to specifically evaluate shallow groundwater contaminant discharge to adjacent streams from the landfill. Upstream or background pore water samples (or samples not influenced by the landfill) would not support this evaluation, nor would it facilitate the assessment of risks. Nevertheless, EPA plans to conduct additional pore water sampling, including upstream and downstream samples, to further investigate pore water at the site. The results will be discussed as part of the OU-3 FS.

The September 2013 pore water samples were collected from six transects along the stream bank, each with 2 to 3 sampling stations across the stream. The February 2016 samples were obtained from 9 selected stations at locations similar to previous sampling events. The September 2013 and February 2016 samples were collected from various depths beneath the sediment surface. These are noted in the station ID with a “-00”, “-02”, or “-04” indicating the samples were taken from right beneath the sediment surface, from 2 feet beneath the surface, for from 4 feet beneath the surface, respectively. The complete pore water analytical data sets are provided in Appendix F-2.

Tables 4-21a through 4-25 summarize analytical data obtained during pore water sampling. The tables only reflect substances detected in at least one sample, and also list the EPA Region 3 BTAG freshwater screening benchmarks (EPA, 2006), the maximum detected concentrations, the number of samples in which the chemical was detected, and the number of samples in which the concentration exceeded its benchmark.

4.2.1 Pore Water Results

As previously noted, three rounds of pore water sampling were conducted in May 2013, September 2013, and February 2016. While metals were analyzed during all three events, other analyses were either performed once or twice, and in some cases, only for selected samples. During May 2013, samples were collected from stations beneath the stream bank closest to the landfill to help identify locations for pore water samples to be collected in September 2013. As a result, the May 2013 results may be more representative of shallow groundwater or leachate emanating from the landfill, rather than pore water quality. However, the results from all rounds were evaluated with an emphasis on total metals since they were more frequently analyzed and may reflect trends for other analytes.

4.2.1.1 Inorganics

Tables 4-21a and 4-21b present the May and September 2013 data for total metals detected in pore water samples. Table 4-21c presents the February 2016 data for total and dissolved metals. The contaminants listed below were detected in pore water samples at least once above freshwater screening levels:

Total Metals

- Aluminum
- Barium
- Arsenic
- Beryllium
- Cadmium
- Calcium
- Copper
- Iron
- Lead
- Magnesium
- Manganese
- Mercury
- Potassium
- Selenium
- Sodium
- Vanadium
- Zinc

Dissolved Metals

- Arsenic
- Barium
- Cadmium
- Copper
- Iron
- Manganese
- Selenium
- Vanadium
- Zinc

Others

- Boron
- Cyanide

Seventeen metals were detected above freshwater benchmarks in unfiltered (for total metal) pore water samples from Lower Darby Creek. Of these, arsenic, barium, iron, lead, manganese, mercury, and selenium were more frequently detected above their respective benchmark values than others.

Nine metals (arsenic, barium, cadmium, copper, iron, manganese, selenium, vanadium, and zinc) were detected above their respective benchmarks in filtered (for dissolved metal) pore water samples. Only a few arsenic, cadmium, selenium, vanadium, and zinc detections exceeded screening levels, and all were related to samples collected from the east side of Lower Darby Creek.

May 2013 Sampling: Total arsenic was detected at concentrations exceeding its benchmark (5 µg/L) in 7 of 12 pore water samples, ranging from 5.4J µg/L at LD129 to 14.9J µg/L at LD110. Total barium was reported at levels exceeding its screening value (4 µg/L) in all 12 samples, ranging from 311 µg/L at LD116 to 1,390 µg/L at LD108. Total lead results exceeded its benchmark (2.5 µg/L) in 10 of 12 samples, ranging from 6 µg/L at LD116 to 676 µg/L at LD126. Iron, manganese, potassium, and selenium were also found at levels greater than benchmarks in most samples.

September 2013 Sampling: Total arsenic was reported at concentrations exceeding its screening value in 16 of 38 pore water samples, ranging from 6.2J µg/L at 1001-04 to 26.5J µg/L at 2501-02. Total barium results were greater than the benchmark in all 38 samples, ranging from 33.5J µg/L at 1803-00 to 643J µg/L at 1603-04. Total lead results were greater than the benchmark in 14 of 38 samples, ranging from 2.6 µg/L at 1802-00 to 183 µg/L at 0303-02.

Total mercury results exceeded its benchmark (0.026 µg/L) in 25 of 38 pore water samples, ranging from 0.034J to 0.13J µg/L. Iron and manganese also were detected at concentrations exceeding their respective screening values in most samples. Boron was detected in all 38 samples from Lower Darby Creek. Total boron concentrations ranged from 21.9 µg/L at 1803-00 to 7,310 µg/L at 2503-02 exceeding the freshwater benchmark of 1.6 µg/L. Cyanide was reported in 4 of 12 samples, ranging from 2J to 26.6 µg/L, and was contained in samples above the benchmark (5 µg/L) in 1603-04 and 2501-02.

February 2016 Sampling: Both total and dissolved arsenic were reported at levels exceeding its benchmark at stations 25-01-00 and 25-01-02. Both total and dissolved barium results were greater than its benchmark in all 19 selected sample locations. Only total lead was found exceeding the benchmark at LD108HT-00, LD108-00, LD126-00, 0301-00, 0301-04, 2501-00, 2501-02, 0303-02, and 1603-00, varying from 3.2 to 425 µg/L. Both total and dissolved iron and manganese were detected at concentrations exceeding their benchmarks in most samples. Cadmium was detected at concentrations exceeding its benchmark (0.25 µg/L) along the east side of the creek at LD108HT-00 and 0301-04 only. Vanadium and zinc were found above benchmarks at 0301-04 only.

Summary: Among the inorganics, exceedances of freshwater benchmarks were noted in all pore water samples. During May 2013, high concentrations of several metals were reported for LD126, LD108, and LD136. During September 2013, elevated levels of metals were found for samples 0303-02, 1001-04, 1603-04, and 2502-0. In February 2016, high concentrations of some metals were detected in samples 0301-04 and 2501-00. In general, inorganic concentrations were greater in samples collected from the eastern side of the creek closest to the landfill.

The total metal results from all three rounds of pore water sampling were further evaluated to better determine patterns of contamination with respect to sample location, depth, and proximity to landfill wastes. The subset of metals selected for this evaluation included aluminum, arsenic, barium, copper, iron, lead, and manganese, since they were generally more frequently detected and often exceeded EPA BTAG freshwater screening values.

The September 2013 results represented the most comprehensive set of total metal pore water concentrations since a greater number of samples were collected by location and by depth. The following findings and conclusions were reached:

- The deepest pore water sample at the same location typically contained the highest concentration of the selected metal evaluated; however, there were several exceptions. Except for the May 2013 event, samples were collected at the stream bottom (noted by the sample nomenclature suffix -00), the 2-ft depth (suffix -02), and the 4-ft depth (suffix -04). The May 2013 samples were obtained from a single depth along the creek stream bank; therefore, whether these metal concentrations increased with depth could not be determined.

- For aluminum, the highest total metal level was reported for station sample 0301-04 in February 2016 (11,000 µg/L). Other elevated aluminum concentrations were noted for sample LD-126 in May 2013 (5,350 µg/L) and sample 0303-02 in September 2013 (1,420 µg/L).

- Among the arsenic results, samples 2501-02 and 2501-00 collected in September 2013 contained 26.5 µg/L and 10.7 µg/L, respectively. In February 2016, sample 2501-00 revealed arsenic at 11.8 µg/L, while deeper sample 2501-00 contained 7 µg/L. Samples 2502-00 (17.3 µg/L in September 2013), 0301-00 (14.7 µg/L in September 2013); 0302-02 (11.4 µg/L in September 2013); LD-110 (14.9J µg/L in May 2013); and LD-108 (12.3 µg/L in May 2013) also contained total arsenic above 10 µg/L.

- The three highest total barium detections were from May 2013 samples LD-108 (1,390 µg/L), LD-132 (1,320 µg/L), and LD-126 (1,290 µg/L). Other elevated barium results were reported for September 2013 samples 1603-04 (643J µg/L) and 2501-00 (635 µg/L).

- The highest results for total copper were reported for samples LD-126 (371 µg/L in May 2013); LD-132 (110 µg/L in May 2013); 0301-04 (68.9 µg/L in February 2016); and 2501-02 (57.6 µg/L in February 2016). Shallower samples collected at stations 0301 and 2501 in February 2016 contained much lower levels of copper (ranging from 2.2 to 8.9 µg/L).

- Among all total metal results, iron was detected at the highest concentrations. The highest total iron detections were reported for samples 0301-00 (81,500 µg/L in September 2013); 0302-02 (78,700 µg/L in September 2013); 2503-02 (76,700 µg/L in February 2016); and 0301-02 (75,000 µg/L in September 2013). Shallow sample 2503-00, collected in February 2016, contained 41,900 µg/L of total iron. In most cases, total iron concentrations were higher for September 2013 samples compared to May 2013 samples. A clear pattern of iron concentrations increasing with pore water sample depth could not be discerned using the September 2013 samples.

- The maximum total detections of lead were associated with samples LD-126 (676 µg/L in May 2013); 0301-04 (425 µg/L in February 2016); LD-132D (279 µg/L in May 2013); LD-136 (263 µg/L in May 2013); and 0303-02 (183 µg/L in September 2013).

- The highest total manganese concentrations were reported for samples 2503-00 (6,930 µg/L in February 2016); 2501-00 (5,020 µg/L in September 2013); LD-136 (4,890 µg/L in May 2013); and LD-132D (4,370 µg/L in May 2013). Similar to total iron results, lead detections did not necessarily increase with sample depth in September 2013 samples.

4.2.1.2 SVOCs

Tables 4-22a and 4-22b present SVOCs detected in pore water samples. Table 4-22c presents PAH results reported for these samples. Several SVOCs were reported at levels greater than benchmarks, all of which were PAHs. The following contaminants were found in samples at least once above their benchmark values:

- 2-Methylphenol
- Benzo(a)anthracene
- Fluoranthene
- Naphthalene
- Anthracene
- Benzo(a)pyrene
- PCP
- Pyrene

May 2013 Sampling: PAHs were found at LD110, LD126, LD129, and LD136 above their relevant benchmarks. 2-Methylphenol was reported above its benchmark (13 µg/L) in LD136 (17J µg/L) only. Anthracene was reported above the benchmark of 0.012 µg/L in LD136 (2.8J µg/L). Benzo(a)anthracene results greater than the screening value of 0.018 µg/L were found in 3 of 12 samples above in LD129 (4.1J µg/L), LD110 (5.1J µg/L), and LD136 (12J µg/L). Benzo(a)pyrene was detected in 3 of 12 samples above its value of 0.015 µg/L at LD129 (4.0J µg/L), LD110 (4.9J µg/L), and LD136 (11J µg/L). Pyrene was detected in 4 of 12 samples above its benchmark of 0.025 µg/L, ranging from 2.6J µg/L at LD126 to 22J µg/L at LD136.

September 2013 Sampling: PAHs were reported at stations 0301, 0302, 0303, 1001, 1002, 1003, 1601, 1602, 1603, 1802, 2501, 2502, 2503, 3301, 3302, and 3303 above respective freshwater screening levels. Anthracene was detected in 22 of 40 samples above its benchmark, with results between 0.018J µg/L at 1001-00 to 2.5J µg/L at 1603-04. Benzo(a)anthracene was found in 13 of 40 samples above its benchmark ranging from 0.018J µg/L at 0303-00 to 0.2 µg/L at 2502-02. Benzo(a)pyrene was reported in 7 of 40 samples above its benchmark with concentrations between 0.017J µg/L at 2502-02 to 0.52J µg/L at 0303-02. Pyrene was found in 27 of 40 samples with results greater than the benchmark value and ranging from 0.03J µg/L at 3303-00 to 0.45 µg/L at 1602-04. PCP was reported at 0.58J µg/L exceeding the screening level in sample 2502-02.

Summary: The PAHs with the greatest number of exceedances were anthracene and pyrene. PAH concentrations contained in the May 2013 samples were much greater (generally by more than an order of magnitude) compared to the September 2013 sample results. These results are perhaps related to the use of different sampling methods during these events. During May 2013, samples were collected from stations beneath the stream bank closest to the landfill to help identify subsequent locations for pore water samples collected in September 2016. As a result, the May 2013 results may better represent shallow groundwater or leachate emanating from the landfill.

Based only on the September 2013 pore water results, five SVOCs were further evaluated to assess patterns of contamination, including 1,4-dioxane and four PAHs (i.e., anthracene, benzo(a)anthracene, fluoranthene, and pyrene). These SVOCs were selected since they were most frequently detected and most often exceeded BTAG freshwater screening values (except for 1,4-dioxane, which had no available screening value). The highest concentrations of these substances were detected in deeper pore water samples collected at each station.

Samples 1603-04 and 1602-04 both contained the highest anthracene concentration (2.5J µg/L), and anthracene was not detected in the shallow samples at these stations. Benzo(a)anthracene was detected in samples 2502-02 and 2501-02 at 0.2 and 0.11 µg/L, respectively; these were the only concentrations greater than 0.1 µg/L among all samples collected. The maximum fluoranthene results were reported for sample 1603-04 (0.46J µg/L) and sample 0303-02 (0.17 µg/L), while the highest pyrene result was for sample 1602-04 (0.45 µg/L).

For 1,4-dioxane, the four highest concentrations were contained in deeper pore water samples 1603-04 (180 µg/L); duplicate 1603-04D (160 µg/L); 1602-04 (170 µg/L); and 2502-02 (100 µg/L). 1,4-Dioxane was not detected in shallow samples from station 1602, and was reported at much lower levels for shallow samples from stations 1603 (ND at the 0-ft depth; 32 µg/L at the 2-ft depth) and 2502 (31 µg/L at the 0-ft depth).

4.2.1.3 Pesticides and PCBs

Tables 4-23a and 4-23b summarize pesticides reported in pore water samples. Eight pesticides were reported in samples from Lower Darby Creek at concentrations exceeding freshwater benchmarks. The most frequently detected pesticides were 4,4'-DDT and alpha chlordane. The following substances were found at least once above their respective screening level:

- 4,4'-DDD
- alpha-Chlordane
- Gamma BHC
- Heptachlor
- 4,4'-DDT
- Beta BHC
- Gamma Chlordane
- Heptachlor epoxide

Pesticides were reported at LD110, LD123, LD126, LD129, and LD136 above their benchmarks during May 2013 sampling. Pesticides were found at stations 0302, 0303, 1001, 1002, 1003, 1601, 1602, 1603, 1802, 1803, 2501, 2502, 2503, 3301, 3302, and 3303 at concentrations greater than benchmarks during September 2013 sampling.

Tables 4-24a and 4-24b present PCBs detected in pore water samples. These samples were analyzed for all 209 PCB congeners, and the results were summed to calculate total homologue groups and total PCBs. Only total PCB results were compared to its freshwater benchmark of 0.074 nanograms per liter (ng/L).

During May 2013 sampling, total PCB concentrations were found in all 4 samples above its benchmark at LD136 (41.6 ng/L), LD126 (574 ng/L), LD129 (58.7 ng/L), and LD132 (1,320 ng/L). During September 2013 sampling event, total PCBs were detected in all six samples above the benchmark at 0301-00 (3.17 ng/L), 0301-02 (6.92 ng/L), 1001-00 (4.71 ng/L), 1001-04 (27.8 ng/L), 1601-00 (5.39 ng/L), and 1601-02 (19.1 ng/L).

Summary: Based on the September 2013 results, three pesticides were selected to evaluate contaminant patterns with respect to depth, including 4,4'-DDT, alpha-chlordane, and gamma-chlordane. These pesticides were chosen because they were detected most often at concentrations exceeding their respective BTAG freshwater screening values. The maximum concentrations of these substances were not always detected in deeper pore water samples. However, pesticide detections were uniformly low.

Samples 1603-04 and duplicate 1603-04D contained the highest 4,4'-DDT concentrations at 0.018J and 0.012J µg/L, respectively. 4-4'DDT in shallower samples at station 1603 ranged from 0.0021J to 0.0073J µg/L. The maximum gamma-chlordane results were reported for samples 1603-04 (0.007J µg/L) and 2503-02 (0.0068 µg/L). Gamma-chlordane was not contained in shallow samples from station 1603.

Sample 1601-00 contained the maximum concentration (0.035J µg/L) of alpha-chlordane, but the 2-ft depth sample at station 1601 was non-detect. For each pore water station except 3302, alpha-chlordane was usually detected at higher levels in shallow samples as compared to deeper samples.

The September 2013 total PCB results for pore water samples were reviewed to assess if a pattern was present with respect to the depth. Data from three stations were available, including 0301, 1001, and 1601. Sample 1001-04 contained 27.8 ng/L of total PCBs (the highest value reported), while the result for shallow sample 1001-00 was 4.71 ng/L. Deeper samples collected at stations 0301 and 1601 also revealed higher total PCB concentrations than shallow samples at these stations.

4.2.1.4 Dioxins and Furans

Table 4-25 summarizes dioxins and furans found in pore water samples. The only dioxin detected was octachlorodibenzo-p-dioxin (OCDD). OCDD concentrations in samples 1001-04 and 1601-02 were used to calculate total TEQ quotients levels for birds, fish, and mammals. The freshwater screening value for TCDD (0.003 pg/L) was used as the surrogate benchmark for fish. Total TEQ concentrations exceeded this benchmark in 1001-04 (0.0239 pg/L) and 1601-02 (0.0479 µg/L).

Similar to PCB results, September 2013 data from three pore water stations were available (0301, 1001, and 1601). OCDD was detected in deeper samples at stations 1001 and 1601 only. OCDD was not found in samples from station 0301.

4.2.2 <u>Pore Water Evaluation Summary</u>

Pore water results indicated the principal classes of contaminants were inorganics, PAHs, pesticides, PCBs, 1,4-dioxane, and dioxins. Numerous inorganics and organics were detected at concentrations greater than freshwater screening benchmarks. Due to different sampling methods and locations, concentrations reported for May 2013 sampling were higher than those from September 2013.

Metal exceedances were found in all pore water sample locations. High concentrations of several metals were detected in samples LD126, LD108, LD136, 0303-02, 1001-04, 1603-04, 2502-02, 0301-04, and 2501-00. In general, concentrations were greater in samples collected from the east side of the creek.

High concentrations of PAHs were detected above benchmarks at LD110, LD126, LD129, and LD136. PAH levels exceeding benchmarks were also reported for stations 0301, 0302, 0303, 1001, 1002, 1003, 1601, 1602, 1603, 1802, 2501, 2502, 2503, 3301, 3302, and 3303. The PAHs with the greatest number of exceedances were anthracene and pyrene.

Low concentrations of pesticides were reported above freshwater screening levels at stations LD110, LD123, LD126, LD129, LD136, 0302, 0303, 1001, 1002, 1003, 1601, 1602, 1603, 1802, 1803, 2501, 2502, 2503, 3301, 3302, and 3303. Total PCB concentrations were noted above its benchmark at stations LD136, LD126, LD129, LD132, 0301-00, 0301-02, 1001-00, 1001-04, 1601-00, and 1601-02. All stations were located along the east side of the creek. The only dioxin detected in pore water was OCDD. Total TEQ concentrations (fish) were greater than the benchmark in 1001-04 (0.0239 pg/L), and 1601-02 (0.0479 µg/L).

The deeper pore water samples at the same station often contained the highest concentrations of the classes of contaminants evaluated. This conclusion was supported by reviewing most of the total metal results (except for iron and manganese), SVOCs (including 1,4-dioxane), several pesticides, total PCBs, and OCDD. The increasing contaminant levels found at depth beneath Darby Creek may be reflective of shallow groundwater discharges near the creek, overland or subsurface leachate flows; contaminant absorption by sediments directly impacted by the site or by upstream sources of contamination; or a combination of these processes. The increasing levels at most locations also may be related to the presence of landfill wastes near them, and the steepness of the hydraulic gradient. Finally, the deeper pore water samples were perhaps less likely to be affected by surface water flow and stream scour. The degree to which each process might contribute to pore water contamination could not be determined with available data, since non-site-related sources were not characterized near the site

In summary, the OU-3 RI developed data to evaluate interactions between shallow groundwater discharges to the creeks adjacent to the landfill using pore water samples. However, additional pore water analytical information along with other supporting data are needed to complete the evaluation. EPA plans to collect additional pore water samples as part of future investigations or response actions at the site. Water-level elevations will also be obtained using piezometers (or similar equipment) to determine the effects of tidal influence on the creeks.

4.3 COMPARISONS BETWEEN LANDFILL GROUNDWATER AND PORE WATER

Three groups of pore water sampling locations and adjacent groundwater wells were evaluated to determine the relationship between landfill groundwater and stream pore water. These paired groups included:

- Cobbs Creek near the northern part of the landfill (station 1802 vs. well cluster MW-07S/D).
- Darby Creek adjacent to the middle of the landfill (station 1601 vs. well MW-06).
- Darby Creek near the southern part of the landfill (station 0301 vs. wells MW-03 and MW-04).

Figures 4-24, 4-25, and 4-26 provide cross-sections displaying the depths of paired wells and pore water samples used in the comparison, along with the estimated influence of pore water contamination beneath the landfill. Results for the paired samples indicated contaminant concentrations in pore water samples were generally less than those in groundwater samples. The pore water intervals shown in these figures demonstrates the estimated areas where pore water may be encountered.

The relationship between groundwater and pore water concentrations is controlled by several factors (see Section 5.0). Depending on physical characteristics and biogeochemical considerations, not all shallow groundwater, overland flow, or subsurface leachate discharging from the landfill are expected to reach the stream bottom in sufficient amounts to affect pore water quality beneath Cobbs and Darby Creeks. One primary factor is the elevation of the groundwater table near the creeks, and elevations of the creek's water surface and sediment bottom. The types of wastes deposited throughout the landfill, their concentrations, and the locations of those wastes in proximity to the creeks may affect contaminant concentrations present in pore water; tidal influences may also affect contaminant concentrations. Some contaminants are more likely to be affected by processes or factors such as attenuation, retardation, degradation, bioaccumulation, redox potential, pH, pressure, and the presence of organic carbon.

Since May 2013 samples were collected from stations beneath the stream bank closest to the landfill, and that sampling method was different from that of September 2013 sampling, the May 2013 results were not considered representative of stream pore water. Therefore, only the results of September 2013 sampling event were selected for comparison to pore water. Figure 4-27 displays the comparison between March and December 2014 groundwater samples and September 2013 pore water samples for selected analytes. The findings of this comparison for each contaminant group are described below and are shown in Table 4-26.

- **Inorganics:** All inorganics detected in pore water samples 1802-00 and 1802-02 were also detected in wells MW-07S and MW-07D. Metal concentrations for groundwater were much higher than those of the pore water samples, except for aluminum and lead. All metals detected in pore water samples from station 1601 (0-ft and 2-ft depths) were also reported in well MW-06, and the groundwater concentrations for these metals were greater than those for pore water, except for aluminum, arsenic, and selenium. The metals reported in pore water samples PW-0301-00 and PW-0301-02 were also found in MW-03 and MW-04. Inorganic groundwater results for these wells exceeded those of the matching pore water samples, except for aluminum, arsenic, and lead.

- **SVOCs and 1,4-Dioxane:** Samples from MW-07S/D contained fewer PAHs but at higher concentrations than pore water samples from station PW-1802. This was also true for the comparison between well MW-06 and station 1601. All PAHs detected in samples from MW-03 or MW-04 were reported detected for station PW-0301, with higher concentrations found in the groundwater samples. PAH levels found in pore water samples may not be entirely related to groundwater discharges to streams, but rather to sediment absorption of PAHs attributable to upstream sources. 1,4-Dioxane was detected in both pore water and groundwater samples. In general, 1,4-dioxane results for groundwater exceeded those for pore water with one exception. Pore water sample 1601-02 collected in September 2013 contained 20 µg/L of 1,4-dioxane while the March 2014 sample from MW-06 revealed 11 µg/L.

- **Pesticides:** Pore water samples from station 1802 (samples collected at 0-ft and 2-ft depths) contained fewer detected pesticides and at lower concentrations than samples from MW-07S/D. The same comparison applied to pore water samples from station 601 (samples obtained at 0-ft and 2-ft depths) vs. the MW-06 results. Pore water sample results from station 0301 revealed much fewer detected pesticides compared to samples from MW-03 or MW-04.

- **PCBs:** Total PCB congeners were reported in 0301-00 and 0301-02 pore water samples at 3,170 pg/L and 6,920 µg/L, respectively. Total PCB congeners were also detected in paired wells MW-03 and MW-04 at 9,900 pg/L and 600,000 µg/L, respectively.

- **Dioxins:** The only dioxin that was detected in pore water samples was OCDD. OCDD was reported for sample 1601-02 at 479 pg/L. OCDD was found in paired well MW-06 at 547 pg/L.

The following contaminants exceeded both available BTAG freshwater screening benchmarks in pore water samples and respective tap water RSLs in groundwater samples:

- Benzo(a)anthracene, PCP, arsenic and manganese in Cobbs Creek, near the northern part of the landfill (station 1802 vs. well cluster MW-07S/D).

- Benzo(a)anthracene, iron, manganese, and heptachlor in Darby Creek adjacent to the middle of the landfill (station 1601 vs. well MW-06).

- Arsenic, iron, manganese, and total PCBs in Darby Creek near the southern part of the landfill (station 0301 vs. wells MW-03/MW-04).

During the OU-1 RI, PAHs were reported in sediment samples from Darby Creek and Cobbs Creek more frequently and at much higher concentrations than other contaminants. PAH levels exceeded their respective RSLs or freshwater screening benchmarks. VOCs and pesticides were found at relatively lower concentrations in sediment samples.

Several inorganics were detected above screening values in sediment samples from Darby Creek. The sediments in Darby and Cobbs Creeks upstream of the landfill (i.e., background) also contained elevated concentrations of metals and PAHs, and relatively low concentrations of pesticides and VOCs. However, PCB congeners were not found in background sediment samples. Therefore, PCB congeners were considered to be good indicators in determining landfill discharges. Due to interactions between shallow landfill groundwater (as well as leachate) and the streams, pore water concentrations were different from those of landfill groundwater. However, PCB congeners were detected in both landfill groundwater and pore water. The combination of groundwater discharges to pore water and downstream migration of contaminated sediments contribute to sediment contaminant concentrations that were documented adjacent to the site.

In comparison with landfill groundwater sample results, pore water concentrations generally correlated with the results reported for wells along Darby and Cobbs Creeks, including inorganics, boron, PAHs, 1,4-dioxane, PCBs, and dioxins. This evaluation helped conclude that substances in landfill groundwater (likely comingled with leachate) would transport or migrate to stream pore water and adjacent surface water bodies through seepage. However, concentrations in surface water would be expected to be lower than pore water due to mixing, dilution, volatilization, and other physical processes (e.g., attenuation, dispersion, and degradation).

Figure 4-28 displays four possible stream segments of concern along Darby Creek, based on the following parameters:

- Elevated USGS streambed pore water conductance results (i.e., greater than 1,962 µs/cm as shown in Figure 3-16).
- Observations of seeps into the creek or along the landfill stream bank during the OU-1 and OU-3 investigations, and the results of the creek conditions assessment as described in Section 3.3.1.
- Elevated pore water sample concentrations greater than freshwater screening benchmarks (particularly for several metals, including aluminum, arsenic, barium, copper, iron, lead, and manganese).
- Elevated shallow groundwater concentrations greater than tap water RSLs (particularly for various metals, pesticides, 1,4-dioxane, and PFAS compounds).

Segment “A” is located downslope from the highest elevations of the landfill and the mound in its center, and is about 80 feet lower in elevation than the landfill mound. Segments “B” and “C” were downslope near the SIA, while Segment “D” was adjacent to other sources of contamination, including the Industrial Drive properties and Sun Oil-Darby Creek Tank Farm (see Figure 1-2). The contaminants most commonly associated with these four segments were arsenic, iron, manganese, and benzo(a)anthracene, based on shallow groundwater and pore water sampling results.

The RI results were inconclusive as to whether the portion of Cobbs Creek near pore water samples 18-02 and 18-03 should be considered as a segment of concern. While these pore water samples contained concentrations greater than screening criteria, EPA relied on all available results to identify stream segments of concern. Pore water samples 18-02 and 18-03 did not contain significant arsenic, 1,4-dioxane, or PAH concentrations. These substances were detected more frequently and at greater levels at other pore water sample locations and within the four identified stream segments of concern. Also, the USGS streambed pore water conductance results were not elevated at 18-02 and 18-03 as shown in Figure 3-16, and no seeps were observed near 18-02 and 18-03.

There was uncertainty whether the portion of Darby Creek between Segments “B” and “C” should be considered as a stream segment of concern since only a few pore water samples were collected along this portion of Darby Creek, namely samples LD129 and LD130. While LD129 contained 1,4-dioxane at 170 µg/L, the LD132 result for this substance was 25 µg/L. PAHs were not detected at either location. The maximum pore water conductance assessment results for this portion of Darby Creek were not as elevated as for the four stream segments of concern, and seeps were also not noted between Segments "B" and "C".

Regardless, EPA plans to obtain additional pore water analytical information and other data in the future to better define and characterize the stream segments of concern. Water-level elevations will be measured and ecotoxicity testing will be conducted as part of this work. Findings will be discussed as part of the OU-3 FS.

4.4 GROUNDWATER FLOW

Hydraulic gradient and groundwater velocity were calculated for the shallow and deep aquifers based on the groundwater levels recorded in June 2015. The calculations were separated for the shallow and deep aquifers. The shallow aquifer was further separated into the landfill area (within the historical extent of the landfill as depicted on Figure 2-3) and the outside landfill area (Eastwick Neighborhood) to present two respective flow conditions.

To calculate groundwater velocity for the shallow aquifer, hydraulic conductivity values available from slug testing and porosity values obtained from the literature were used. For the deep aquifer, both the hydraulic conductivity and porosity values were obtained from the literature. Therefore, the calculations should be considered estimates for comparative purposes only.

The resulting calculations are summarized below:

Aquifer Characteristics				
Aquifer	Hydraulic Gradient (ft/ft)	Porosity (%)	Hydraulic Conductivity (ft/day)	Groundwater Velocity (ft/day)
Shallow inside Landfill	0.023	39*	6.5	0.38
Shallow outside Landfill	0.0053	39*	3.1	0.042
Deep	0.016	44**	42.5***	1.52

* Median of published values for medium sand (Morris and Johnson, 1967)
** Median of published values for weathered granite (Morris and Johnson, 1967)
*** Median of published values for fractured igneous and metamorphic rock (Domenico and Schwartz, 1990)

The calculated hydraulic conductivity and groundwater velocity indicate that groundwater generally flows an order of magnitude faster through the landfill than it does through the Eastwick Neighborhood. However, groundwater in the shallow aquifer appears to flow an order of magnitude slower than that in the deep aquifer. While this does not provide estimates as to the rate at which various contaminants migrate through the shallow and deep aquifers since it does not include absorption/adsorption rates or retention times, it generally indicates that contamination will move somewhat quickly through the shallow aquifer and then transport will slow down once it enters the neighborhood.

The vertical gradient between the shallow and deep aquifers was qualitatively analyzed using well pairs containing well screens in both the shallow and deep aquifers to estimate the flow direction between the two aquifers. The resulting vertical gradients are summarized below:

Vertical Gradient Comparison				
Well Pair	Shallow Well Water Table Elevation (ft/msl)	Deep Well Water Table Elevation (ft/msl)	Change in Elevation (ft, negative value implies a decrease in elevation between wells)	Flow Direction
MW-13S/D	-0.52	-1.15	0.63	Down
MW-14S/D	1.18	2.76	-1.58	Up
MW-15S/D	-1.83	-1.95	0.12	Down
MW-17S/D	11.68	8.93	2.75	Down
MW-18S/D	5.97	5.82	0.15	Down

The comparison between water table elevations indicates that groundwater flow direction is primarily downwards from the shallow aquifer to the deeper aquifer, except for the MW-14 pair. It should be noted that the changes in elevations are small at most of the locations (under 1 foot), indicating that the two aquifers are connected without a defined confining layer, as would be expected in the observed geology outside of the historical extend of the landfill.

5.0 CONTAMINANT FATE AND TRANSPORT

In this section, the fate and transport of groundwater contaminants at the site and adjacent creeks are assessed. This section contains information about chemical properties and degradation potential of site contaminants, environmental conditions at the site, and hydrological considerations that have a possible impact on contaminant fate and transport.

The principal classes of contaminants detected in groundwater were metals, VOCs, SVOCs, PAHs including 1,4-dioxane, pesticides, PCBs, dioxins, and PFCs. In general, high contaminant concentrations were detected in samples collected from wells located at landfill area and the Eastwick neighborhood adjacent to landfill boundary. The fate of chemicals in the environment is determined by several physical, chemical, and biological factors. Physical properties, such as specific gravity, solubility, and vapor pressure play a role in determining what processes take place for a chemical (or class of chemicals), but often vary considerably from location to location. The fate and transport of COPCs that may pose risk to human health and the environment are described in this section.

5.1 CHEMICAL AND PHYSICAL PROPERTIES IMPACTING FATE AND TRANSPORT

Table 5-1 presents the physical and chemical properties of the organic compounds detected in site groundwater, as identified in Section 4.0. The properties of these chemicals can be used to estimate their mobility and fate in the environment, and include the following parameters:

- Specific gravity
- Vapor pressure
- Water solubility
- Henry's Law Constant
- Octanol/water partition coefficient (K_{ow})
- Organic carbon partition coefficient (K_{oc})
- Soil-water distribution coefficient (K_d)
- Bioconcentration factor (BCF)
- Mobility index (MI)

Available empirically determined literature values for water solubility, octanol/water partition coefficient, organic carbon partition coefficient, vapor pressure, Henry's Law constant, bioconcentration factor, mobility index, and specific gravity are presented in Table 5-1. Calculated values obtained using approximation methods are presented when literature values are not available, and when values could be computed. A discussion of the environmental significance of each parameter follows.

5.1.1 Specific Gravity

Specific gravity is the ratio of the density of a given volume of pure chemical at a specified temperature (usually 20°C) to the density of the same volume of water at a given temperature (usually 4°C). Its primary use is to determine whether a pure form of the chemical will have the tendency to float or sink in water. Chemicals with a specific gravity greater than 1 (e.g., halogenated aliphatic compounds and PAHs) tend to sink if present as a pure liquid. If a large enough spill of these compounds occurs, these chemicals may migrate as a bulk liquid and will mix with or sink into the aquifer. Chemicals with a specific gravity less than 1, including some monocyclic aromatics such as benzene and ethylbenzene, tend to float. If a large enough spill of these compounds occurs, these chemicals will migrate through the soil as a bulk liquid, but instead of going into solution, most of the spill will remain a discrete layer on the water table surface.

Specific gravity becomes important only when chemicals are pure-phase liquids and at very high concentrations. Free-product oil as non-aqueous phase liquid (NAPL) was noted during drilling of several borings and wells at the site.

5.1.2 Vapor Pressure

Vapor pressure indicates the rate at which a chemical volatilizes from both soil and water. It is of primary importance at environmental interfaces, such as surface soil/air and surface water/air. Volatilization from creek sediment could also be significant under low-flow conditions (e.g., during summer months and drought conditions) when it is exposed to the atmosphere in a dry creek bed. Vapor pressures for VOCs (monocyclic aromatics and halogenated aliphatics) are generally many times greater than vapor pressures for other organic compounds (e.g., PAHs, pesticides, PCBs, dioxins, and PFCs). Chemicals with higher vapor pressures volatilize into the atmosphere much more readily than chemicals with lower vapor pressures. Volatilization is not significant for most inorganics. Volatilization from groundwater or pore water is not an important loss mechanism of contaminants at this site.

5.1.3 Water Solubility

The rate at which a chemical is leached from a waste deposit by precipitation infiltration is proportional to its water solubility. More soluble chemicals are expected to infiltrate much more readily and rapidly than less soluble chemicals. Water solubilities presented in Table 5-1 indicate that most VOCs are several orders of magnitude more soluble than most PAHs and PCBs. As such, VOCs are more frequently detected in groundwater. However, both PAHs and PCBs were also detected in groundwater and pore water at this site.

Chemicals detected in groundwater at concentrations that exceed one percent of their solubility are considered potential NAPL. Free-product oil was found in well MW-10, located in the central portion of the landfill, and in wells MW-04 and MW-12, located in the southern industrial area.

5.1.4 Henry's Law Constant

Both vapor pressure and water solubility can be used to determine volatilization rates from surface water bodies and groundwater. The ratio of these two parameters, the Henry's Law constant, is used to calculate equilibrium chemical concentrations in the vapor (air) phase versus the liquid (water) phase for the dilute solutions commonly encountered in environmental settings. In theory, chemicals (e.g., PCBs and PAHs) having a low Henry's Law constant (less than 1×10^{-5} atmosphere cubic meter per mole [atm-m^3/mole]) volatilize very little, and are present only in minute amounts in the atmosphere or within soil gas, while chemicals (e.g., many VOCs) with a higher Henry's Law constant (greater than 5×10^{-3} atm-m^3/mole) tend to volatilize into air and diffuse in soil gas more readily.

5.1.5 Octanol/Water Partition Coefficient

K_{ow} is a measure of the equilibrium partitioning of chemicals between octanol and water. A linear relationship has been established between the K_{ow} and the uptake of chemicals by fatty tissues of animal and human receptors, also known as the BCF (Lyman et al., 1990). K_{ow} is useful for characterizing the sorption of compounds to organic soils where experimental values are not available. PAHs, dioxins, and PCBs have K_{ow} values several orders of magnitude higher than water-soluble VOCs, and are therefore more likely to partition to fatty tissues. Relatively simple organic chemical molecules usually have low K_{ow} values. K_{ow} values are also used to estimate BCFs in aquatic organisms.

5.1.6 Organic Carbon Partition Coefficient

K_{oc} indicates the tendency of a chemical to adhere to organic matter contained in soils. Many VOCs have relatively low K_{oc} values, and thus tend to be fairly mobile in the environment. Chemicals with high K_{oc} values generally have low water solubility, and vice versa, so K_{oc} may be used to infer the relative rates at which more mobile chemicals (e.g., monocyclic aromatics and halogenated aliphatics) are transported in groundwater. Most PCBs and PAHs are relatively immobile in soil, and are preferentially bound to soil, and are not as subject to groundwater transport when compared to compounds with higher water solubility, but can be transported via erosion when they occur in surface soils. Several factors affect the measured value of $K_{oc.}$ Values of K_{oc} usually decrease with increasing temperature. The fine silt and clay fractions of soil and sediment have higher concentrations of organic matter (and a higher number of adsorption sites per unit volume) and may tend to absorb chemicals more than soil and sediment with lower organic content.

5.1.7 Bioconcentration Factor

The BCF measures the tendency for a chemical to accumulate in biological and ecological systems. The BCF represents the ratio of a chemical's concentration in the tissue of an aquatic-organism to the chemical's concentration in water. The ratio is both contaminant- and species-specific, as well as specific to tissue type. When site-specific values are not measured, literature values are used, or the BCF is derived from the $K_{ow.}$ Pesticides (e.g., aldrin, chlordane, and dieldrin) and metals (e.g., copper and mercury) are known in bioconcentrate and accumulate in fatty tissues of exposed organisms at concentrations much higher than the environmental concentration.

5.1.8 Soil-Water Distribution Coefficient

K_d is a measure of the equilibrium distribution of a chemical in soil/water systems. The K_d of organic chemicals is a function of both the K_{oc} and the fraction of organic carbon (f_{oc}) in the soil:

$$K_d = K_{oc} \times f_{oc}$$

The degree to which an organic chemical sorbs to soils is important when assessing it migration potential. If a chemical tends to sorb strongly to soil, it is unlikely that it will dissolve in groundwater and affect groundwater quality.

5.1.9 Mobility Index

The MI is a quantitative assessment of mobility that uses water solubility (S), vapor pressure (VP), and the K_{oc}. It is defined as

$$MI = \log [(S*VP)/K_{oc}]$$

A scale to evaluate MI is shown below:

Relative MI	Mobility Description
> 5	extremely mobile
0 to 5	very mobile
-5 to 0	slightly mobile
-10 to -5	immobile
< -10	very immobile

Most VOCs detected at the landfill have MIs greater than 0 and are considered very mobile. Low molecular weight PAHs, such as naphthalene, have MIs ranging from -5 to 0, and are considered slightly mobile. High molecular weight PAHs [e.g., benzo(a)pyrene] are classified as very immobile, because they have MIs less than -10. Relative MIs for organic contaminants found at the landfill are included in Table 5-1.

5.1.10 <u>Inorganic Site Contaminants</u>

Table 5-2 includes the physical and chemical properties of inorganics identified in Section 4.0. The solubility and mobility of inorganics present in soils are strongly influenced by their valence state(s) and mineral forms (e.g., silicates, hydroxides, oxides, carbonates, etc.). The solubility of a metal also depends on pH, redox potential (Eh), temperature, and other ionic species present in solution (the Debye-Hückel theory). Nearly all metals are more soluble at an acidic pH rather than alkaline pH. Transitional metals like iron, manganese, and chromium have more than one valence state, and are more soluble in their reduced valence states, so these metals are more soluble under reducing conditions. Solubility products reported in literature vary by metal and the type of complex formed; for example, cadmium and copper complexes are generally more soluble than lead and nickel complexes.

The K_d for inorganic constituents is the ratio of its concentration adsorbed on the soil surface to its concentration in water, and vary by several orders of magnitude because the K_d is dependent on the size and charge of the ion, and the properties governing exchange sites on soil surfaces. Overall, arsenic and hexavalent chromium have lower K_d values, and hence have greater mobility. Lead generally has much higher K_d values and is therefore less mobile in the environment.

5.2 POTENTIAL ROUTES OF MIGRATION

The release of contaminants from uncontrolled landfill sites occurs in all of three chemical phases – liquid, solid, and gas. The RI for OU-3 will focus on possible groundwater migration routes, including:

- Landfill leachate to groundwater migration
- Groundwater migration
- Groundwater/leachate to surface water migration
- Groundwater to air (vapor intrusion)

5.2.1 <u>Landfill Leachate to Groundwater Migration</u>

Subsurface soil within a large area of the landfill has been impacted by municipal, construction, and other waste. Analytical data indicated groundwater (both shallow and deep) has been affected by site-related contaminants. Consequently, the soil/waste to groundwater pathway will continue to be a major transport pathway if contaminated soil and waste are in contact with groundwater, because precipitation continues to percolate into the vadose zone, thereby transporting contaminants to groundwater.

Moreover, roughly one-third of the waste within the landfill lies below the shallow water table in saturated soil that has been artificially raised due precipitation-related mounding of groundwater onsite. The shallow groundwater (or leachate, because it is in contact with the waste material) is directly over a fractured bedrock surface, and has the potential to impact deeper groundwater in the area. Groundwater recharge, in the form of infiltration, occurs through the landfill waste. The infiltrating water leaches soluble materials, and mobilizes particulates and any existing nonaqueous free-oil liquids from the waste. Significant infiltration occurs during precipitation because the landfill lacks an engineered cover and drainage system. Mounding and retention of precipitation has infiltrated through soil and waste and impacted groundwater for more than 40 years. The elevation of the shallow groundwater mound is expected to decrease once the OU-1 ET cover is in place. However, even after this takes place, a significant portion of waste will remain saturated below the natural water table.

5.2.2 <u>Groundwater Migration</u>

Horizontal and vertical groundwater data indicate that groundwater (both shallow and deep) underneath the site has been impacted by site-related contaminants. The landfill is underlain by an unconfined water table aquifer in which shallow groundwater flows from high elevations to low elevations by natural gradients. OU-1 RI groundwater flow modeling indicated shallow groundwater flows radially away from the mound located in the central portion of the landfill. A large fraction of the shallow flow from the landfill is directed eastward toward the Eastwick neighborhood. Substantial flow also exits into Cobbs Creek north of the landfill, and Darby Creek west and south of the landfill, near the South 84th Street Bridge, where, historically, oily seepage has been observed on the eastern bank of Darby Creek.

Figure 3-24 shows the overburden/shallow aquifer flow net (groundwater elevation contours with perpendicular flow direction lines) constructed using elevations above the mean sea level (MSL) measured in April 2016. If a well pair was present, the water level elevation in the shallow well was used to represent the water table condition at that location. TCE, 1,4-dioxane, and arsenic present in the deep aquifer flow in the east/southeastward direction as shown in Figures 4-17, 4-19, and 4-21, respectively.

5.2.3 <u>Groundwater/Leachate to Surface Water Migration</u>

Shallow groundwater flows locally in a radial pattern, outward from the landfill toward Darby and Cobbs Creeks, southward below the southern industrial area, and east below the Eastwick neighborhood. A net analysis of shallow groundwater flow and pore water sampling results indicate shallow groundwater beneath the landfill discharges to Cobbs Creek and Darby Creek. Contaminants in groundwater and creek sediment pore spaces can leach and migrate into surface water.

Leachate seeps discharging to Darby Creek occur seasonally along drainage swales located on the western and southern perimeters of the landfill, and supply another pathway for the migration of leachate contaminants to surface water.

5.2.4 Groundwater to Air Migration (Vapor Intrusion)

Since contaminant plumes emanating from the landfill in both shallow and deep groundwater move in the general direction of groundwater flow, and toward the Eastwick neighborhood, concerns were raised about potential migration of vapors from volatile substances in the groundwater into overlying buildings. Under certain conditions, vapor from the groundwater can intrude into homes through cracks in basement floors, walls, drain tiles, sumps, foundations, and utility lines. The vapors may accumulate in dwellings or buildings to levels that may pose short-term safety hazards, acute health effects, or aesthetic problems. However, most homes in the Eastwick neighborhood have no basement. In addition, data collected during the soil gas survey performed in this neighborhood indicated VOC concentrations in soil gas were not substantially high.

VOCs potentially related to the Clearview Landfill were detected in several air samples collected from various sampling locations (Tetra Tech, 2012b). In many instances, it appeared sources of these VOCs may not be related to the site, but rather activities inside of the buildings and/or the outdoors. However, it could not be concluded with complete certainty that those VOCs which historically have been associated with the site and were also detected beneath or inside of a property could not be attributable to the landfill. There was often overlap between the VOCs detected in the landfill and those commonly used in household items.

Subsequent modeling of potential vapor migration was conducted to assess potential human exposure to soil (and/or landfill) gas (Appendix I). The modeling estimated indoor air concentrations using soil gas data from vapor monitoring wells and soil borings installed within City Park and Eastwick neighborhood, and determined VOC concentrations in indoor air were relatively insignificant.

No significant accumulation of any vapors was noted under any structure. Some minimal intrusion of VOCs from beneath the foundations may be occurring in several homes. However, the risk assessment findings indicated no unacceptable risks were present. Given these findings, no additional investigation or action is necessary to address vapor intrusion issues related to the landfill.

5.3 CONTAMINANT PERSISTENCE

Several physical, chemical, and biological processes affecting site contaminants are discussed in this section, including hydrolysis, photolysis, volatilization, sorption, bioaccumulation, biodegradation, and oxidation/reduction reactions. COPCs from the following general classes of compounds detected in groundwater and/or pore water samples were evaluated during the human health or ecological risk screening (discussed in detail in Section 6.0), including:

- VOCs - monocyclic aromatics
- VOCs - halogenated aliphatics
- PAHs
- SVOCs
- Pesticides
- PCBs
- Dioxins/furans
- PFCs
- Inorganics (metals, boron, and cyanide)

5.3.1 VOCs - Monocyclic Aromatics

Five monocyclic aromatics (1,2-dichlorobenzene, 1,4-dichlorobenzene, benzene, chlorobenzene and ethylbenzene) were detected above screening criteria in shallow and/or deep groundwater. Benzene and ethylbenzene have specific gravities less than that of water. These compounds are typically found in fuels; if a large enough fuel spill occurs, these compounds may move through the soil column as a bulk liquid until they reach the water table. Once there, instead of going into solution, most of the release may remain as a discrete fuel layer on the surface of the water table, with some dissolving into solution at the water/fuel interface.

Monocyclic aromatic compounds such as benzene and ethylbenzene are not considered persistent in the environment, particularly in comparison with other chemicals such as PCBs, pesticides, and metals. Monocyclic aromatics are subject to degradation via soil and aquatic microorganisms. Although these compounds are known to be amenable to microbial degradation, their rate of degradation depends on the availability of nutrients and proper microbial populations. If these compounds discharge to surface water bodies, volatilization and biodegradation may occur relatively rapidly.

For example, the first-order degradation rate constant (k) for benzene is 0.11 day^{-1} in aquatic systems (Lyman et al., 1990); this corresponds to an aquatic half-life ($t_{1/2}$) of approximately six days (i.e., 0.693/k).

Environmental degradation processes like hydrolysis and photolysis are insignificant fate mechanisms for monocyclic aromatics in aquatic systems (EPA, 1982).

Monocyclic aromatics are subject to similar degradation processes in aquatic environments (EPA, 1982). However, chlorinated monocyclic aromatics such as 1,4-dichlorobenzene and chlorobenzene are not expected to be as susceptible to microbial degradation. For example, the first-order biodegradation rate constant for chlorobenzene is 0.0045 day^{-1} in aquatic systems (Lyman et al., 1990); this corresponds to a half-life of approximately 150 days.

5.3.2 <u>VOCs - Halogenated Aliphatics</u>

Eight halogenated aliphatics (1,1-dichloroethane, 1,1,2-trichloroethane, 1,2-dichloroethane, 1,2-dibromo-3-chloropropane, cis-1,2-dichloroethene, chloroform, TCE, and vinyl chloride) were detected at concentrations exceeding screening criteria in site groundwater.

Halogenated aliphatics, such as TCE and vinyl chloride, are subject to reductive dehalogenation via anaerobic bacteria. Research indicates that degradation of highly chlorinated ethanes is a relatively slow process. Under reducing conditions, aquifer microorganisms can reductively dechlorinate tetrachloroethene (PCE) and TCE to less chlorinated daughter products (i.e., dichloroethene, and vinyl chloride). The dechlorination process may stall at vinyl chloride because vinyl chloride typically degrades more readily under aerobic conditions. However, vinyl chloride can be efficiently and rapidly destroyed under anaerobic conditions if sufficient donor and target bacteria are present. Recent industry experience indicates that not only *Dehalococcoides* (Dhc), but the TCE reductive dehalogenases (RDase) (tceA) and VC RDase (vcrA and bvcA), must also be present for complete destruction to occur. It does not appear that appreciable degradation of halogenated aliphatics occurs in aerobic aquatic systems (EPA, December 1982) or unsaturated soils (Lyman et al., 1990). Photolysis is also not considered a relevant degradation mechanism for this class of compounds (EPA, 1982). Limited hydrolysis of saturated aliphatics (i.e., alkanes) may occur, but it does not appear to be a significant degradation mechanism for unsaturated species (i.e., alkenes) (EPA, 1982).

Transport of halogenated aliphatics from groundwater to surface water can occur. When discharged to surface water, these compounds tend to volatilize rapidly due to their high solubility and higher vapor pressures.

5.3.3 <u>Polycyclic Aromatic Hydrocarbons</u>

Eight PAHs (2-methylnaphthalene, naphthalene, benzo(a)anthracene, BAP, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene) were detected above screening criteria in groundwater at the site. PAHs are generally regarded as very persistent in the environment. PAHs have very low solubilities, low vapor pressures, low Henry's Law constants, and high K_{oc} and K_{ow}. Biodegradation of PAHs is likely, but is lengthy. The overall persistence of individual PAHs varies with their molecular weight and other factors. Low molecular weight PAHs (e.g., 2-methylnaphthalene and naphthalene) are more environmentally mobile than the higher molecular weight PAHs (e.g., BAP, benzo(a)anthracene, and benzo(k)fluoranthene), and are therefore more likely to leach to groundwater.

PAHs with higher molecular weights are less mobile and tend to adhere to soil particles, and may be transported via mass transport mechanisms. PAHs with lower molecular weights are much more water soluble than the heavier PAHs (by two to five orders of magnitude), and consequently would be expected to be detected in water more frequently and at higher concentrations.

PAHs are subject to slow degradation via aerobic bacterial metabolism, and may be relatively persistent in the absence of microbial populations or macronutrients such as phosphorus and nitrogen. Bioconcentration of PAHs in aquatic organisms is much greater for high molecular weight compounds than low molecular weight compounds. PAHs can be bioaccumulated from water, sediments, or lower organisms in the food chain.

The most important fates of PAHs in water are photo-oxidation, chemical oxidation, and biodegradation. PAHs do not contain functional groups that are susceptible to hydrolytic action, and hydrolysis is considered to be an insignificant degradation mechanism. The rate of photodegradation is influenced by water depth, turbidity, and temperature. BAP is moderately persistent in the environment; it readily binds to soils and does not leach to groundwater, although it has been detected in some groundwater. If released to water, it will adsorb strongly to sediments and particulate matter, and will resist breakdown by microbes or reactive chemicals. However, it may evaporate from water or be degraded by sunlight. BAP is expected to bioaccumulate in aquatic organisms that cannot metabolize it, including plankton, oysters, and some fish.

5.3.4 <u>SVOCs</u>

Five SVOCs, such as 1,4-dioxane, bis(2-ethylhexyl)phthalate, 2,6-dinitrotoluene, bis(2-chloroethyl)ether, and PCP, were detected in site groundwater at concentrations exceeding screening criteria.

1,4-Dioxane is fully miscible with water, most organic solvents, aromatic hydrocarbons, and oils, and is chemically classified as an ether. The low K_{oc} for 1,4-dioxane suggests that it will not significantly sorb to soil organic matter or suspended sediments, and should readily leach from soils to groundwater. Its moderate vapor pressure of 38 mm Hg at 25° C indicates it should readily volatilize from dry soil, and its estimated Henry's Law constant of 4.8×10^{-6} atm-m^3 /mol indicates volatilization from moist soils will be slow. 1,4-Dioxane is unlikely to form a vapor plume in the vadose zone above a dissolved phase plume, essentially rendering soil gas measurement techniques ineffective in tracking it. Also, 1,4-dioxane is not known to significantly bioaccumulate, does not readily biodegrade under normal ambient conditions, and has an estimated atmospheric half-life of 1-3 days. It is expected to be difficult to treat by common remedial processes.

Bis(2-ethylhexyl)phthalate is considered to be relatively persistent in the environment. Although numerous studies have demonstrated that phthalate esters undergo biodegradation, it appears to be a slow process in both soil and surface water. Biodegradation of bis(2-ethylhexyl)phthalate in water has a half-life of 2 to 3 weeks (Howard, 1990). Bioaccumulation is also a significant fate process. Hydrolysis of phthalate esters is very slow, with calculated half-lives of 2,000 years (EPA, 1979). Similarly, photolysis and volatilization are insignificant degradation mechanisms (EPA, 1979; Howard, 1989).

2,6-Dinitrotoluene is slightly mobile in soil. Degradation in soil is fairly rapid, as it broken down by sunlight and bacteria into substances such as carbon dioxide, water, and nitric acid (ATSDR, 1998). In water, 2,6-dinitrotoluene has a slight tendency to adsorb to sediments and suspended solids. Volatilization from water does not appear to be a significant transport process. 2,6-Dinitrotoluene has a relatively long half-life in aquatic systems, facilitating aquatic transport (ATSDR, 1998). Degradation of dinitrotoluenes in water can occur via several mechanisms, including photolysis, microbial biodegradation, ozonation, and chlorination; oxidation by strong oxidants such as hydrogen peroxide, ozone, or oxone can also occur (ATSDR, 1998). 2,6-Dinitrotoluene's K_{ow} suggests that its bioaccumulation potential in aquatic organisms is quite low (Hansch et al., 1995 as cited in HSDB, 2004).

Bis(2-chloroethyl) ether has low K_{ow} and high water solubility, it is not expected to adsorb to soil or sediment and is therefore considered to be mobile in these media. Based on the low-to-moderate Henry's Law constant, it would tend to remain in water.

PCP in surface waters undergoes biotransformation and photolysis, and is adsorbed to sediment. Hydrolysis, oxidation, and volatilization do not significantly affect surface water concentrations. PCP in soil can slowly biodegrade, and it may also leach into groundwater. In soil and sediment, PCP is adsorbed, or is metabolized by acclimated microbes, under both aerobic and anaerobic conditions. Adsorption of PCP in soils is pH dependent. For example, at pH 4.7, PCP is 50% ionized, whereas at pH 6.7, the compound is about 99% ionized (ATSDR, 2001). Therefore, the compound is most mobile in neutral-to-basic mineral soils and least mobile in acidic organic soils. Volatilization and photolysis do not appear to be important transport and transformation processes for PCP in soils. Under reductive conditions in soil and sediment, PCP can be degraded within 14 days to 5 years, depending on the anaerobic soil bacteria that are present. In aquatic systems, photolysis and biodegradation are believed to be the dominant transformation processes for PCP. Hydrolysis, oxidation, and volatilization do not significantly affect surface water concentrations. Biotransformation in the water column above sediments occurs at a greater rate under aerobic than under anaerobic conditions (ATSDR, 2001).

5.3.5 Pesticides

Whether pesticides are sprayed, dusted, or applied directly to the soil, the soil is the ultimate sink. Bioconcentration of pesticides in the food chain is an important fate mechanism. Persistence is determined by biotic and abiotic degradation processes. Biotic processes are biodegradation and metabolism; abiotic processes are mainly hydrolysis, photolysis, and oxidation (Calamari and Barg, 1993). Modern pesticides tend to have short half-lives that reflect the period over which the pest needs to be controlled (Edwin D. Ongley, 1996). Hydrolysis half-lives reported for several pesticides range from months to years. Volatilization may be an important loss mechanism for some pesticides (e.g., aldrin and dieldrin) in aquatic systems.

5.3.6 PCBs

The PCBs used in many industrial applications were chemical mixtures made up of a variety of individual chlorinated biphenyl components known as congeners. Most commercial PCB mixtures are known in the United States by their industrial trade names. The most common trade name is Aroclor.

PCBs are nonpolar and therefore are only slightly soluble. This characteristic inhibits the transport of PCBs from soil to water (groundwater or surface water), and makes them bind strongly to soils. PCBs can be transported to surface water via erosion of contaminated soil particles in surface water runoff. Since they are heavier than water and do not readily dissolve, they are adsorbed onto particles of sediment. These particles are transported in suspension and eventually settle into river-bottom sediment. The finer the sediment particles, the more easily PCBs are adsorbed.

PCBs are very persistent organic chemicals and, may therefore remain in the environment for long periods of time, cycling between air, water, and soil. Although PCBs have a strong affinity for sediment, small amounts of PCBs are released from sediment to water over time (ATSDR, 2000). Once in the water, PCBs are also taken up by small organisms and fish, and accumulates in the fatty tissue of these organisms.

PCBs have a relatively low vapor pressure. Despite their low volatility, PCBs do volatilize from both soil and water, resulting in their widespread presence and extreme stability. Once re-emitted, PCBs can be transported long distances in air, and then redeposited by settling or scavenging by precipitation.

Biodegradation is the only process known to transform PCBs under environmental conditions, but only the lighter PCB compounds are measurably biodegradable (EPA, 1979). Some fungi such as Phanaerochaete chrysosporium may biodegrade PCBs, although such microorganisms may not exist in local soil. There is experimental evidence to suggest that heavier PCBs (those with five or more chlorines per molecule) can undergo photolytic degradation, but there are no data to suggest that this process operates under environmental conditions (EPA, 1979). Base-, acid-, and neutral-promoted hydrolysis are inconsequential degradation mechanisms for PCBs (EPA, 1979).

5.3.7 Dioxins and Furans

Dioxin and dioxin-like compounds are ubiquitous in the environment (ATSDR, 1998). Dioxins congeners are usually released to the environment primarily through emissions from the incineration of municipal and chemical wastes, in exhaust from automobiles using leaded gasoline, and from the improper disposal of certain chlorinated chemical wastes. Dioxins and furans are extremely stable, both chemically and thermally. They are soluble in lipids, and are biologically nearly non-degradable (persistent). Dioxins do not easily dissolve in water; therefore, most dioxins that enter surface water become strongly attached to particles and eventually settle in sediment. Dioxins that deposit on land bind strongly to soil particles. Particles and oils contaminated with dioxins can occasionally result in contamination of groundwater.

Dioxin is a general grouping term that describes hundreds of chemicals that are highly persistent in the environment. The most toxic compound is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). The toxicity of other dioxin congeners is measured in relation to TCDD.

Vapor-phase TCDD may be degraded by reaction with hydroxyl radicals and direct photolysis. Particulate-phase TCDD may be physically removed from air by wet and dry deposition. If released to water, TCDD will predominantly be associated with sediment and suspended material. TCDD near the water's surface may experience some photodegradation. Partitioning from the water column to sediment and suspended material will occur. Volatilization from the water column may be important, but adsorption to sediment will limit the overall rate by which TCDD is removed from water. The persistence half-life of TCDD in lakes has been estimated to be more than 1.5 years. Bioconcentration in aquatic organisms has also been demonstrated. If released to soil, TCDD is not expected to leach. Photodegradation on terrestrial surfaces may be an important transformation process. Volatilization from soil surfaces during warm conditions may be a major removal mechanism. The persistent half-life of TCDD on soil surfaces may vary from less than one year to three years, but half-lives in soil interiors may be as long as 12 years. Screening studies have shown that TCDD is generally resistant to biodegradation (Institute of Medicine, 2003).

5.3.8 PFCs

The two most commonly researched PFCs, and the ones most prevalent in the environment, are PFOS and PFOA (ATSDR, 2009). PFOS and PFOA compounds are highly soluble in water and typically present as an anion (conjugate base) in solution and have very low volatility due to their ionic nature (ATSDR, 2009). Long chain PFCs have low vapor pressure, and aquatic environments are expected to be their primary sink in the environment (Environment Canada, 2010). These compounds do not readily degrade by most natural processes. They are thermally, chemically, and biologically stable, and are resistant to biodegradation, atmospheric photooxidation, direct photolysis, and hydrolysis.

The structure of PFCs increase their resistance to degradation; the carbon-fluorine bonds require a lot of energy to break, and the fluorine atoms shield the carbon backbone (OECD, 2002). PFCs have been found worldwide in soil, groundwater, surface water, rain, ice caps, air, plants, animal tissue, and blood serum (Furl & Meredith, 2010). The highest concentrations found in the environment tend to be associated with direct discharge from industries where PFCs are in use. PFCs are mobile in soil and leach into groundwater (SERDP, 2012).

5.3.9 Inorganics

Metals are highly persistent environmental contaminants. They do not biodegrade, photolyze, hydrolyze, etc. The major fate mechanisms for metals are adsorption to the soil matrix (rather than being incorporated into the soil structure) and bioaccumulation.

The mobility of metals is influenced primarily by their physical and chemical properties, in combination with site geochemical conditions. Some key parameters affecting mobility of metals in groundwater and pore water are listed in Table 5-2. Factors that assist in predicting the mobility of inorganic species in the aquatic environment are pH, redox potential (Eh), sorptive interactions, and cation exchange capacity. The mobility of metals generally increases with decreasing soil pH and cation exchange capacity. The persistence and behavior of inorganic contaminants commonly detected in groundwater and pore water at the site are discussed below:

Aluminum: This metal exists in only one oxidation state (+3) in the environment, and does not undergo oxidation-reduction reactions. It can react with other matter in the environment to form various complexes. The fate and transport of aluminum is largely controlled by environmental factors such as pH, salinity, and the presence of various species with which it may form complexes. In general, the solubility and mobility of aluminum in soil is greatest when the soil is rich in organic matter and capable of forming aluminum-organic complexes, and when the pH is low, such as in areas prone to acid rain or in acidic mine tailings. The most abundant aluminum compounds are aluminum oxide and aluminum hydroxide, both of which are not water soluble. Aluminum oxide may be present in water both in alkalic form and in acidic form. At pH values greater than 6.0 in aqueous systems, aluminum has low solubility and generally precipitates onto sediment or substrate material. At lower pH values, aluminum will mobilize and become one of several inorganic forms, such as an aluminum monomeric, hydroxide, or fluoride.

Antimony: Antimony is released to the environment from natural and industrial sources. Most antimony ends up in soil, where it attaches strongly to particles that contain iron, manganese, or aluminum. Antimony in both aerobic freshwater and seawater environments is largely in the +5 oxidation state, although antimony in the +3 oxidation state also occurs. Trivalent antimony is the dominant oxidation state of antimony in anaerobic water. Antimony can be reduced and methylated by microorganisms in anaerobic sediment, releasing volatile methylated antimony compounds into the water.

The binding of antimony to soil is determined by the nature of the soil and the form of antimony deposited on the soil. Some forms of antimony may bind to inorganic and organic ligands, while its mineral form would be unavailable for binding. Due to the relatively high solubility of antimonite and antimonite ions, most of antimony in transduced into the aquatic environment is transported in solution. Antimony is known to form co-precipitates with hydrous iron, manganese, and aluminum oxides in soil and sediment (Callahan et al. 1978). Antimony is only slightly bioaccumulated.

Arsenic: This metal exists as either arsenate (AsO_4^{3-}) or arsenite ($H_2AsO_3^-$) in the subsurface environment. Of these, arsenite is the more toxic form and are reported to be 4-10 times more soluble than arsenate compounds. Arsenic is chemically very similar to phosphorus. Like phosphate, arsenate forms insoluble precipitates with iron, aluminum, and calcium. The adsorption of arsenite is strongly pH-dependent, with an increase in sorption of arsenite by kaolinite (a mineral consisting of aluminum silicate) and montmorillonite (a very soft silicate mineral that typically forms in microscopic crystals, forming a clay) over a pH range of 3-9 units, and a maximum adsorption by iron oxide at pH 7. The adsorption of arsenite has been found to be rapid and irreversible, and iron oxide, redox, and pH were the most important properties in controlling arsenite adsorption by soils (McLean and Bledsoe, 1992).

Both pH and the redox are important in assessing the fate of arsenic. At high redox potentials, arsenate predominates and arsenic mobility is low. As the pH increases or the redox decreases, arsenite predominates. This reduced form of arsenic is more subject to leaching because of its high solubility. Formation of arsenite may also lead to the volatilization of arsine and methyl-arsines from soils. Under soil conditions of high organic matter, warm temperatures, adequate moisture, and other conditions conducive to microbial activity, the reaction sequence is driven towards methylation (a term used to denote the attachment or substitution of a methyl group on various substrates) and volatilization (McLean and Bledsoe, 1992).

Although the redox state of a system is important, arsenic solubility and transport is dominated by adsorption reactions that occur at the surface of reactive iron and aluminum oxide minerals. Adsorption of arsenic oxyanions by mineral surfaces is favored at low pH, and adsorption decreases in magnitude with increasing pH in a manner consistent with other anions (Sigg and Stumm, 1981). In general, arsenate is adsorbed to a greater extent than arsenite, except at elevated pH (>9) where the opposite occurs (Xu et al., 1988; Wilkie and Hering, 1996; Raven et al., 1998). Consequently, in most environmental systems arsenite is more mobile and bioavailable, and hence more toxic than arsenate.

Both total and dissolved arsenic were frequently detected in most groundwater wells at concentrations exceeding its RSL (0.052 µg/L). Landfill area well MW-41S had the highest total and dissolved arsenic results detected, at concentrations of 84.1 µg/L and 58.8 µg/L, respectively. Total and/or dissolved arsenic concentrations greater than its MCL (10 µg/L) were detected at several wells, including MW-01S, MW-02, MW-03, MW-07S, MW-08, MW-09, MW-11, MW-14S, MW-15S, MW-25, MW-26D, MW-27, MW-36, MW-37, and MW-41S. Arsenic was not reported above the MCL in deep (bedrock) groundwater samples outside the landfill boundary. Total and dissolved arsenic were also present in several pore water samples above its EPA BTAG freshwater screening level (5 µg/L). The groundwater contaminant levels detected in wells MW-25 and MW-26D may not be attributable to the landfill because they are near other suspected sources of contamination south of 84th Street.

Barium: Barium is not very mobile in most soil systems, due to the formation of water-insoluble salts and the inability of the barium ion to form soluble complexes with fulvic and humic acids. The rate of transportation of barium in soil is dependent on the characteristics of the soil material. Soil properties that influence the transportation of barium to groundwater are cation exchange capacity, calcium carbonate ($CaCO_3$) content, and pH. In aquatic media, barium is likely to precipitate out of solution as an insoluble salt. Waterborne barium may also adsorb to suspended particulate matter through the formation of ion pairs with natural anions such as bicarbonate or sulfate. Sedimentation of suspended solids removes a large portion of the barium content from surface waters. Barium mobility is reduced by the precipitation of barium carbonate and sulfate.

Beryllium: This metal has a very low aqueous solubility under normal pH conditions, and is probably precipitated or adsorbed onto solids soon after introduction to the aqueous environment. Formation of soluble complexes may tend to increase its solubility, but it appears that under most circumstances, beryllium is associated with the particulate rather than the dissolved components of natural water systems. Although beryllium has low solubility in water, it is possible that benthos could accumulate beryllium from sediment and thereby transfer the metal to higher organisms via the food chain.

Boron: Boron is widely distributed in surface water and groundwater. The average surface water boron concentration in the United States is about 0.1 mg/L, but concentrations vary greatly depending on the boron content of local geologic formations and anthropogenic sources of boron. Drinking water surveys generally do not report boron concentration. Concentration ranges of boron in tap water have been reported to be between 0.007 mg/L and 0.2 mg/L in the U.S. and England, and the National Inorganics and Radionuclides Survey (completed in 1987) reported relatively widespread occurrence of boron in 989 public water supplies (ATSDR, 1992).

As an element, boron itself cannot be degraded in the environment; however, it may undergo various reactions that change the form of boron (e.g., precipitation, polymerization, and acid-base reactions) depending on conditions such as its concentration in water and pH. Boron readily hydrolyzes in water to form the electrically neutral, weak monobasic acid, boric acid (H_3BO_3), and the monovalent ion $B(OH)_4^-$. Because most environmentally relevant boron minerals are highly soluble in water, it is unlikely that mineral equilibria will control the fate of boron in water. Boron can be co-precipitated with aluminum, silicon, or iron to form hydroxyborate compounds on the surfaces of minerals. Waterborne boron may be adsorbed by soils and sediments. Adsorption-desorption reactions are expected to be the only significant mechanism that will influence the fate of boron in water. The extent of boron adsorption depends on the pH of the water and the chemical composition of the soil. The greatest adsorption is generally observed at pH 7.5–9.0. It is unlikely that boron will bioconcentrate significantly by organisms from water based on its bioconcentration factor (ATSDR, 1992).

Cadmium: Cadmium may be adsorbed by clay minerals, carbonates, and iron and manganese oxides, or precipitated as cadmium carbonate, hydroxide, and phosphate. Evidence suggests that adsorption may be the primary mechanism of cadmium removal in soils. In soils and sediments contaminated with metal wastes, the greatest percentage of the total cadmium was associated with the exchangeable fraction. Cadmium concentrations have been shown to be limited by cadmium carbonate in neutral and alkaline soils. As with all cationic metals, the chemistry of cadmium in the soil environment is controlled by pH. Under acidic conditions, cadmium solubility increases, and very little adsorption of cadmium by soil colloids, hydrous oxides, and organic matter takes place. At pH values greater than 6, cadmium is adsorbed by the soil solid phase or is precipitated, and the solution concentrations of cadmium are greatly reduced. Cadmium forms soluble complexes with inorganic and organic ligands, in particular with chloride ions. The formation of these complexes will also increase cadmium mobility in soils (McLean and Bledsoe, 1992).

Chromium: This metal exists in two possible oxidation states as trivalent chromium (Cr^{3+}) and as hexavalent chromium ($Cr+^6$). Most trivalent chromium in aquatic environment is hydrolyzed and precipitates as $Cr(OH)_3$. Sorption processes and bioaccumulation will remove $Cr+^3$ from solution. Under certain natural water conditions, chromium can exist in hexavalent form. Hexavalent chromium ions are more toxic than trivalent chromium ions. Hexavalent forms chromium in the environment include the chromate ion (CrO_4^{2-}) and the dichromate ion ($Cr_2O_7^{2-}$), depending on pH. Hexavalent chromium present in most natural waters (pH>6.5) will be in the form of the chromate ion. All anionic forms of chromium are quite soluble and mobile in the aquatic environment. The dichromate ions pose a greater health hazard than chromate ions. Because of the anionic nature of hexavalent chromium, its association with soil surfaces is limited to positively charged exchange sites, the number of which decreases with increasing soil pH.

Trivalent chromium forms hydroxy complexes in natural water, including $Cr(OH)_2^+$, $Cr(OH)^{2+}$, $Cr(OH)_3$, and $Cr(OH)_4^-$. Trivalent chromium is readily adsorbed by soils, and is least mobile in soils at pH of 5. Hydroxy species of trivalent chromium precipitate at pH 4.5 units, and complete precipitation of the hydroxy species occurs at pH 5.5 units. Hexavalent chromium can be reduced to trivalent chromium under normal soil pH and redox conditions in the presence of soil organic matter as the electron donor.

Iron and aluminum oxide surfaces will adsorb chromate ions at acidic and neutral pH ranges. The adsorption of hexavalent chromium by groundwater alluvium is primarily due to the iron oxides and hydroxides coating the alluvial particles. The adsorbed hexavalent chromium is, however, easily desorbed with groundwater recharge due to its nonspecific binding. The presence of chloride and nitrate has little effect on hexavalent chromium adsorption, whereas sulfate and phosphate inhibit adsorption. Hexavalent chromium is highly mobile in soil and is one of the metals that are highly mobile in alkaline soils. However, clay soil containing free iron and manganese oxides significantly retards hexavalent chromium mobility (McLean and Bledsoe, 1992).

Copper: Copper is retained in soils through exchange and specific adsorption mechanisms. At concentrations typically found in native soils, copper precipitates are not stable. Copper exhibits a very complex behavior in aquatic environment. Sorption processes are probably most important for controlling copper distribution. Under normal conditions, most copper in solution is in complexed form. Copper is adsorbed to a greater extent by soil and soil constituents than most other metals, except for lead. Copper, however, has a high affinity for soluble organic ligands and the formation of these complexes may greatly increase copper mobility in soil (McLean and Bledsoe, 1992).

Cyanides: Cyanides are a diverse group of compounds whose fate in aquatic environment varies widely. Hydrogen cyanide (HCN), the most common and most toxic of cyanides, may be destroyed by biodegradation or can be removed from solution by volatilization or adsorption. Cyanide ions (CN^-) can react with a variety of metals to form insoluble metal cyanides. If the cyanide ion is present in excess, complex metallocyanides may be formed. Volatilization and biodegradation are dominant processes affecting HCN and the nitriles. Adsorption can also result in removal of those cyanides from solution. The simple metal cyanides are insoluble and probably accumulate in the bed sediments. Complex metallocyanides are quite soluble and can be transported in solution.

Iron and Manganese: These metals are common elements in soil and widely distributed in nature. Iron exists in soil and minerals mainly as insoluble ferric oxide and iron sulfide (pyrite). Under reducing (anaerobic) conditions, the ferric iron (Fe^{3+}) is reduced to ferrous iron (Fe^{2+}) which is very soluble in water.

Manganese is a transitional element which exists in a variety of oxidation states. Manganese is widely distributed in nature, but does not occur as a free metal. Manganese is generally present in ambient waters in an insoluble oxidized form ($Mn0_2$), which becomes entrained in sediment. In oxygen-poor waters, chemical reactions may convert the oxidized form to Mn^{+2}, which is more soluble. Under reducing conditions, the manganese in the dioxide form is reduced from an oxidation state of IV to II, and becomes soluble in water, as with ferric oxide.

Groundwater that contains appreciable amounts of iron or manganese is always devoid of dissolved oxygen (DO) and high in carbon dioxide. The high carbon dioxide content indicates that bacterial oxidation of organic matter has been extensive, and the absence of DO shows that anaerobic conditions have developed. However, when a groundwater aquifer is recharged with oxygen-bearing water, the soluble iron content in the water sometimes increases, which seems to contradict the above stated need for anaerobic conditions. The explanation for this phenomenon is that the oxygen is consumed through the oxidation of insoluble pyrite (FeS_2), leading to anaerobic conditions and the formation of soluble ferrous sulfate (Sawyer and McCarty, 1978).

Lead: Lead is a naturally occurring, bluish-gray metal that is found in small quantities in the earth's crust. Lead is an element forming approximately 0.002 % of the earth's crust. The most important lead-bearing minerals are galena (PbS), cerussite ($PbCO_3$), crocoite ($PbCrO_4$), and pyromorphite [$Pb_5(PO_4)_3Cl$].

Lead is very stable and accumulates in the environment, and is present in a variety of organic and inorganic forms such as lead acetate, lead chloride, lead chromate, lead nitrate, and lead oxide. Pure lead is insoluble in water; however, the lead compounds vary in solubility from insoluble to water soluble.

Most lead encountered in the environment today is inorganic (e.g., lead oxide and lead chloride). Organic lead compounds include several common high-pressure lubricants (lead soaps), and the gasoline anti-knock agents such as tetraethyl lead (TEL) and tetramethyl lead (TML). TEL and TML are lipid-soluble liquids of high volatility and are insoluble in water. Organic lead can be more toxic than inorganic lead since the body can readily absorb it.

Sediment also acts as an accumulation sink for lead compounds. Insoluble lead compounds (e.g., TEL/TML and lead oxide) are adsorbed to sediment or accumulate on suspended matter (in particular the clay fraction). Groundwater is adversely affected by soluble lead compounds (e.g., lead chloride [up to 9.9 μg/L] and lead nitrate). Lead is not chemically affected by deoxygenated water.

The sorption rate of lead depends on the properties of the soil. Lead has a considerable affinity with humic substances. The pH is important for the availability of lead from its compounds. As with other metals, a low pH is linked to a high degree of desorption into the soil solution. However, as lead is quite immobile, it remains in the soil and is not easily absorbed by plants. Therefore, soil represents an important sink for lead compounds.

The mobility of lead in ambient waters is usually controlled by its adsorption to both inorganic and organic solids, organic chemicals, and hydrous ions, and manganese oxides. Lead bioaccumulates in organisms and has the potential to be remobilized by biomethylation. The adsorptive and bioaccumulative capacities of lead enhance its persistence. Organic lead may be absorbed through animal skin, although this type of uptake is generally not significant. Inorganic lead may affect terrestrial receptors through inhalation and ingestion of food, and exposure routes for aquatic species are more likely to be related to skin and gill absorption. Low levels of lead are generally not available for uptake by plants.

Mercury: This metal exists in the natural environment in several forms, including elemental mercury [Hg^0], mercurous ions [Hg_2^{2+}], and mercuric ions [Hg^{2+}], depending on soil pH and redox potential. Both the mercurous and mercuric mercury ions are adsorbed by clay minerals, oxides, and organic matter. Adsorption is pH dependent, typically increasing with increasing pH. Mercurous and mercuric mercury are also immobilized by forming various precipitates. Mercurous mercury precipitates with chloride, phosphate, carbonate, and hydroxide; however, at concentrations of mercury commonly found in soils, only the phosphate precipitate is stable.

In alkaline soils, mercuric mercury will precipitate with carbonate and hydroxide to form a stable solid phase. At lower pH and high chloride concentration, mercuric chloride ($HgCl_2$) is formed. Divalent mercury will also form complexes with soluble organic matter, chlorides, and hydroxides that may contribute to its mobility (McLean and Bledsoe, 1992).

Under mildly reducing conditions, both organically bound mercury and inorganic mercury compounds may be degraded to the elemental form of mercury. Elemental mercury can readily be converted to methyl or ethyl mercury by biotic and abiotic processes. These are the most toxic forms of mercury. Removal of mercury from groundwater is generally through volatilization and/or precipitation rather than adsorption by clays, and increases with increased pH. The amount of mercury removed by volatilization appears to be affected by the solubility of the mercury compounds and soil adsorption capacity (McLean and Bledsoe, 1992). Mercury is strongly bioaccumulated.

Nickel: Nickel is a relatively mobile heavy metal. Although sorption and precipitation do not appear to be as effective as they are with many of other heavy metals, sorption processes scavenge nickel from solution. Nickel has an affinity for organic materials, hydrous iron, and manganese oxides. Most of the common aqueous ligands form moderately soluble compounds with nickel. In polluted environments, the more prevalent organic materials will keep nickel soluble. In reducing environments, insoluble nickel sulfide may be formed. Although nickel is bioaccumulated, partitioning into the biota is not dominant fate process.

Zinc: This metal is readily adsorbed by clay minerals, carbonates, or hydrous oxides, with the large percent of total zinc being associated with iron and manganese oxides. Precipitation is not a major mechanism of retention of zinc in soils because of the relatively high solubility of zinc compounds. Precipitation of zinc sulfide is an important control for the mobility of zinc in reducing environments. As with all cationic metals, zinc adsorption increases with pH. Zinc is known to hydrolyze at pHs greater than 7.7, and these hydrolyzed species are strongly adsorbed to soil surface. Zinc forms complexes with inorganic and organic ligands that will affect its adsorption reactions with the soil surface (McLean and Bledsoe, 1992).

5.4 CONTAMINANT MIGRATION

This section discusses factors affecting contaminant migration for groundwater, and identifies the potential the potential contaminant release and transport mechanisms.

5.4.1 Factors Affecting Contaminant Migration

In the subsurface environment, groundwater contaminant transport is strongly influenced by groundwater flow and soil properties. Some factors are discussed briefly below.

5.4.1.1 Hydraulic Conductivity

Hydraulic conductivity is a measure of the capability of a material to transmit water, and determines the ability of the water to flow through the soil under a specified hydraulic gradient. The following table presents the range of expected values for the hydraulic conductivity of various geologic materials (LaGrega et al., 1994):

TYPICAL RANGES OF HYDRAULIC CONDUCTIVITY FOR VARIOUS SOILS	
Soil Type	**Hydraulic Conductivity (cm/sec)**
Clean gravel	1×10^{5} to 1.0
Clean sand or sand + gravel mixtures	1.0 to 1×10^{-3}
Fine sands and silts	1×10^{-2} to 1×10^{-6}
Silty clay and clay	1×10^{-5} to 1×10^{-9}
Municipal waste (saturated)*	1×10^{-3}

The landfill reportedly received large amounts of municipal solid waste (MSW). The hydraulic conductivity of MSW appears to be similar to that of clean sand or sand/gravel mixtures. However, hydraulic conductivity values for given material types may be quite different from that for the entire formation, which are generally estimated within an order of magnitude accuracy.

As discussed in Section 2.5, slug testing was performed during the RI to characterize aquifer properties, including hydraulic conductivity (K). Average hydraulic conductivity values ranged from 1.11 to

144.29 ft/day for the shallow aquifer (equivalent to 0 to 0.05 cm/sec). These results were representative of clean sand or sand/gravel soil type mixtures. As the slug tests were performed across screened intervals that may have included multiple soil types, more accurate hydraulic conductivity values could not be assigned to each soil type noted in boring logs.

5.4.1.2 Gradients

Vertical and horizontal gradients of groundwater contaminant migration are beneath the site. Groundwater flows from high elevations to low elevations by natural gradients. Based on the analysis of groundwater flow on-site, a shallow groundwater mound currently exists under the landfill, resulting in radial groundwater flow away from the center of the landfill. The presence of the mound, coupled with downward hydraulic gradients between shallow and deep wells at the same location, likely resulted in shallow contaminants migrating to the deep (bedrock) aquifer.

Groundwater flows outward from the landfill toward Darby and Cobbs Creeks, south below the southern industrial area, and east below the Eastwick neighborhood. Horizontal gradients in shallow groundwater outside the landfill boundary are generally controlled by surface drainage features; however, the hydraulic head associated with the mound does not appear to limit all localized flow from the shallow aquifer into the creeks as shallow groundwater flow extends to the east (see Figure 3-18). Patterns in shallow plumes of 1,4-dioxane (Figure 4-18) and PFC (Figure 4-20) also support this conclusion. Groundwater gradients are typically low in the shallow aquifer outside the landfill boundary.

Several pairs of shallow and deep wells including MW-01S/D, MW-05S/D, MW-07S/D, MW-13S/D, MW-14S/D, MW-15S/D, MW-16S/D, and MW-20S/I/D were evaluated to assess vertical hydraulic gradients. Water table elevations in the shallow wells appeared to be higher than those in the deep wells, indicating downward hydraulic gradients at all well pairs. Therefore, it is likely that hydraulically separate zones exist above/below discontinuous silt/clay layers in the study area. The vertical gradient between the shallow and deeper bedrock zones is downward throughout most of the site. Contaminant concentrations in groundwater within each well pair were also evaluated.

Vertical upward gradients were noted at the MW-14S/D well pair in the northern portion of the landfill south of Cobbs Creek. However, the difference in water-level elevations in most well pairs was quite small (e.g., less than 1 foot) and thus indicated a strong hydraulic interconnection between shallow and deep aquifers with relatively limited vertical flow.

5.4.1.3 pH

An overall pH of about 6.0 to 7.5 standard units (SU) is typical for groundwater in the study area. The pH of groundwater is an indicator of its ability to mobilize metals in acidic conditions or to precipitate them in alkaline conditions. In general, pH of groundwater in the study area showed no tendency to either preferentially mobilize or precipitate metals.

5.4.1.4 Oxidation-Reduction Potential

The redox potential is a numerical index of the intensity of oxidizing or reducing conditions in a system, and is useful in estimating chemical reactions involving electron transfer that should occur in the groundwater. Groundwater ORP values for most wells during the four quarterly sampling events remained characteristic of a reducing environment. Groundwater DO values were also very low in most wells as a reducing condition is prevailing. Nitrate and iron concentrations are two primary indicators that the redox conditions in study-area groundwater are under mildly reducing conditions.

During the second round of groundwater sampling, nitrate was detected in 26 of 62 wells, ranging from 0.15 mg/L to 6.78 mg/L. Nitrite was detected in 18 of 62 wells (range was 0.05-2.5 mg/L), and sulfate was detected in 56 of 62 wells (range was 0.5-138 mg/L). The presence of nitrate suggests that conditions in the groundwater are not strongly reducing. Before sulfate reduction to sulfides (indicative of strongly reducing conditions) could occur, nitrate would be used as an electron acceptor and be converted to nitrogen gas.

Ferric iron (Fe^{+3}) forms highly insoluble $Fe(OH)_3$ in oxygenated water, whereas the reduced ferrous iron (Fe^{+2}) ions would be the soluble iron species present under anoxic (reducing) conditions. Under strongly reducing conditions in which sulfides are formed, iron again forms an insoluble compound (ferrous sulfide) and reduces the iron concentration in the water. Anaerobic, low-Eh conditions in groundwater can be more conducive to migration for some types of contaminants (e.g., heavy metals). Redox conditions can also have an important influence on biodegradability of halogenated VOCs.

5.4.1.5 Precipitation, Infiltration, and Runoff

Per the National Oceanic and Atmospheric Administration (NOAA), mean annual precipitation is approximately 41 inches at the site. Factors that affect the relative amount of precipitation that runs off or infiltrates to the groundwater include surface soil type and permeability, surface slope, and soil cover.

Groundwater recharge occurs throughout the landfill area. Visually, little or no runoff occurs from the landfill during smaller storm events. Based on water level mapping and groundwater flow directions presented on

Figure 3-24, groundwater recharge occurs primarily in enclosed drainage basins (on the eastern side of the landfill) that do not drain into the Darby and Cobbs Creeks.

5.4.2 Fate of Contaminants

Various natural processes affecting the fate of contaminants in the groundwater are summarized in tabular form below:

NATURAL PROCESSES AFFECTING FATE OF GROUNDWATER CONTAMINANTS		
Process	**Class of Chemical**	**Effect**
Sorption	Organic	Retardation
Precipitation	Inorganic	Retardation
Ion exchange	Inorganic	Retardation
Filtration	Organic/inorganic	Retardation
Chemical oxidation-reduction	Organic/inorganic	Transformation/retardation
Biological uptake	Organic/inorganic	Retardation
Biodegradation	Organic	Transformation
Hydrolysis	Organic	Transformation
Volatilization	Organic	Elimination by intermedia transfer
Dissolution	Organic/inorganic	Mobility enhancement
Ionization	Organic	Mobility enhancement
Complexation	Inorganic	Mobility enhancement
Immiscible phase	Organic	Various partitioning

Modified from LaGrega et al. (1994)

Retardation refers to processes that impede the transport of contaminants by removing or immobilizing them from a free state (i.e., aqueous solution or vapor). Prime examples of chemical processes that result in retardation are sorption and precipitation. It is important to note that the immobilized contaminants in the retardation processes are not transformed and the processes are reversible.

Attenuation refers to two types of processes: (1) irreversible removal and (2) transformation. Removal by an attenuation process differs from retardation in that it reduces the mass of a substance. A common example is a process that transfers the contaminant to another media (e.g., volatilization). More commonly, the molecular structure of the substance is transformed (e.g., oxidation-reduction).

Some natural processes increase the mobility of substances in the subsurface. Examples include dissolved organic substances and complex metallic ions. Such processes are categorized as mobility enhancement.

5.4.2.1 Fate of Inorganics

Precipitation and sorption/ion exchange affect migration of inorganics in groundwater. Precipitation is the converse of dissolution: the concentration of a solute exceeds the solubility of that particular compound, and any excess solute changes to a solid and thus precipitates out of the solution. Precipitation is reversible, and if the concentration of a solute drops below its precipitant's solubility, dissolution could occur. Precipitation is particularly applicable to heavy metals.

Precipitation depends greatly on pH of the soil/groundwater system. Most metals precipitate at high pH levels as hydroxides. However, continued elevation of pH will increase the solubility of amphoteric (having characteristics of both an acid and a base) metals such as nickel.

Precipitation of a given metal species also depends on redox potential (Eh). When used together with pH, an Eh/pH diagram can be developed for a given metal that indicates the species that a given metal will exist in under various Eh and pH conditions.

Metal precipitation is also dependent on the presence of anions and competing cations that exceed the solubility product constant which, in turn, causes the metal to form insoluble inorganic compounds. For example, based on the Eh/pH diagram for barium, one could assume that barium is soluble at all pHs and all Ehs. However, the presence of sulfate or phosphate ions will cause the barium to form insoluble barium sulfate or barium phosphate, and therefore be removed from solution and become immobile. Solubility product constants are indicators of the tendency of a given compound to form in solution depending on the individual cations and anions of a product.

Ion exchange involves the sorption of ions in solution onto oppositely charged discrete sites on the surface of a soil particle. Ion exchange can be considered as a subcategory of sorption. Therefore, both terms, ion exchange and sorption, are used interchangeably to explain this phenomenon for inorganics. It is driven by attractive force of maintaining electrostatic neutrality; the electric charges on the soil surface are balanced by equivalent free ions of opposite charge. Both anions and cations take part in ion exchange processes. Clays are particularly effective at adsorbing cations because their surfaces are consistently negatively charged. The tendency for adsorption amongst the major cations (from strongest to weakest) in natural waters is as follows: $Ca2+ > Mg2+ > K+ > Na+$. Calcium ions in groundwater may be exchanged onto the clay surface, replacing existing sodium ions.

The process in which ions compete for the exchange sites and displace a previously held cation is termed cation-exchange selectivity. Typically, displaced cations include sodium and calcium. Multivalent cations are more strongly adsorbed than monovalent ions, and smaller cations tend to replace large cations. Clay-mineral bearing rocks and sediment will naturally adsorb heavy-metal cations from contaminated water.

In addition, ion exchange capacity is strongly dependent on pH. As the pH is lowered below neutrality, hydrogen ions readily replace metal ions. Note that ion exchange of metals in soil may be partially reversible; saturated exchange sites can replace cations in response to pH changes and as concentrations of contaminants decline in groundwater. Furthermore, the exchange capacity of a subsurface material can be saturated such that eventually the transport of contaminants is unaffected by ion exchange.

Most elevated metal concentrations in groundwater were detected near the center of the landfill in wells MW-01S, MW-01D, MW-9, MW-10, and MW-11 (Figure 3-1). Well MW-11 consistently contained the highest levels of many metals (aluminum, antimony, arsenic, barium, cadmium, chromium, cyanide, iron, lead, mercury, nickel, etc.) during each round of sampling. Several wells adjacent to the eastern landfill boundary and within the Eastwick neighborhood (wells MW-15S, MW-15D, MW-41S, and MW-41D) also contained high metal levels. However, metal concentrations in groundwater significantly decreased at increasing distance from the landfill in all directions, in both shallow and deep aquifers. This was best reflected by the pattern of arsenic contamination shown in Figure 4-21, but was also true for other metals likely attributable to the site.

Compared to other classes of contaminants, most metals (especially heavier metals such as antimony, lead, mercury, and thallium) generally did not migrate very far from the landfill or from locations where they were placed as wastes. In addition to the factors discussed previously in this section, metal concentrations detected in groundwater may be related to the quantity or volume of wastes containing each metal, the physical state of the disposed waste [liquid, semi-solid (e.g., sludge), or solid], the concentration of that metal as deposited, and depth to which it was placed. Metal-containing wastes placed directly into the water table may have affected groundwater quality to a greater extent than other wastes.

5.4.2.2 Fate of Organics

Organics leaching from the soil/waste into groundwater can migrate as dissolved constituents in groundwater. Three general processes govern the migration of dissolved constituents in groundwater: advection, dispersion, and retardation. Advection is a process by which solutes are carried by groundwater movement. Dispersion is a mixing of contaminated and uncontaminated water during advection. Retardation is a slowing of contaminant migration caused by the reaction of solute with the aquifer soil.

Due to their partition coefficients, PAHs, pesticides, PCBs, and dioxins/furans in the environment will partition primarily to soil and sediment. Leaching to groundwater is not a dominant transport pathway for these large organic molecules. Microbial degradation is the primary degradation mechanism affecting organic compounds in groundwater. In addition to the general processes described above for inorganic contaminants, the mobility and persistence of organics contaminants are also influenced by decomposition and transformation from microbes. Therefore, most of the factors affecting the microbial metabolism will affect the degradation of organics contaminants in groundwater.

Sorption is the tendency for a chemical to adsorb to aquifer grains. The sorption of organic constituents in groundwater may be the most important factor affecting the fate of organic compounds. Sorption reduces the rate of contaminant migration as the solute continuously sorbs and desorbs to maintain local equilibrium. This reduction in migration rate is referred to as retardation of contaminant in groundwater. Sorption will affect the rate of volatilization, diffusion, leaching, and the availability of the compounds to microbial degradation.

Organic contaminants can be divided into three subgroups to discuss their sorptive behavior: (1) ionic or charged species; (2) uncharged species; and (3) uncharged nonpolar species. In general, many of the common organic contaminants in groundwater are the nonpolar species, including TCE, the chlorinated benzenes, and the more soluble components of hydrocarbon fuels such as benzene, toluene, and xylene (BTEX). Other organic contaminants including pesticides and phenols exist in solution as either charged or polar molecules.

Most organic substances in the subsurface will undergo transformation to smaller molecules via oxidation and reduction induced by the metabolic activity of native microorganisms. Enzymes produced by microorganisms enable modification of toxic compounds into less toxic forms. Such transformation is termed biodegradation. Biodegradation can continue as mineralization when microorganisms use organic compounds as a source of carbon and energy, or as co-metabolism where microorganisms need other sources of carbon and energy and the transformation of pollutants occurs as a concurrent process. The effectiveness of degradation rates varies depending on the conditions present in the environment, including the input of pollutants, physical parameters (oxygen content, temperature, light intensity, pH, conductivity), and biological parameters (presence of microorganisms able to degrade a given pollutant and the availability of carbon and/or other sources of energy). All the above variables determine the rate of biological and physical transformation of contaminants.

Due to the small amount of oxygen in the subsurface, most transformation occurs via reducing pathways of anaerobic processes. Anaerobic biodegradation occurs at very slow rate in the subsurface; however, it favors dehalogenation of chlorinated compounds that typically resist aerobic degradation. Note that anaerobic degradation may not always transform organic compounds to less toxic or less mobile forms. For example, the anaerobic degradation of TCE produces the more toxic vinyl chloride (VC).

Hydrolysis is a chemical reaction in which water reacts with a compound to produce other compounds, and involves the splitting of a bond and the addition of a hydrogen ion or the hydroxide anion from the water. For most chemicals, hydrolysis has a relatively insignificant effect compared to other attenuation processes.

However, for chlorinated compounds, which are typically not readily transformed by biodegradation, hydrolysis may play a significant role. Hydrolysis of chlorinated organics involves exchange of the hydroxyl group from a water molecule with an anionic group on a carbon atom. This reaction typically forms alcohols or alkenes.

Most PAHs detected at the landfill are very slow to degrade naturally and readily stick to soil and sediment. PCBs are even more persistent in the environment than PAHs are, and act in a similar manner. Dioxins are generally resistant to biodegradation, and pesticides have varying rates of natural degradation, but are also very slow to degrade naturally.

The migration patterns of PAH, PCB, and dioxins/furans contamination in groundwater were not as extensive as other classes of contaminants. While there were a few detections greater than RSLs, MCLs, or both for these compounds, these detections were generally occurred within the landfill boundary or just outside it. As previously stated, these compounds are larger molecules, so they do not readily leach to groundwater, and are less likely to migrate as compared to other contaminants.

1,4-Dioxane is fully miscible with water, most organic solvents, aromatic hydrocarbons, and oils. It will not significantly sorb to soil organic matter or suspended sediments, and should readily leach from soil to groundwater. It is unlikely to form a vapor plume in the vadose zone above the dissolved phase plume. 1,4-Dioxane does not readily biodegrade under normal ambient conditions. PFOS and PFOA are highly soluble in water, and have very low volatility. These compounds do not readily degrade by most natural processes. They are thermally, chemically, and biologically stable, and are resistant to biodegradation, atmospheric photooxidation, direct photolysis, and hydrolysis.

The likely sources of 1,4-dioxane contamination appeared to be the center of the landfill and the southern industrial area. Figures 4-18 and 4-19 display the patterns of 1,4 dioxane contamination in shallow and deep aquifers, respectively. 1,4-Dioxane is present in paint strippers, dyes, greases, varnishes, waxes, as well as anti-freeze. It migrates rapidly and ahead of other contaminants, at indicated by the pattern of the shallow plume south and east of the landfill. The deeper plume appears smaller than the shallow plume.

Given these factors, the 1,4-dioxane and combined PFOA/PFOS plumes in the shallow aquifer extend east to at least the Penrose Plaza Shopping Center, and south to Korman Residential at International City Chalets (Figures 4-18 and 4-20). The extent of these shallow plumes was defined by wells MW-32 and MW-47 to the east, as they were the farthest wells sampled in that direction. To the south, the plume boundaries may be affected by dilution with greater distance from the landfill and southern industrial area.

5.4.3 Groundwater Migration Pathways

5.4.3.1 Migration of Landfill Leachate to Groundwater

The site has a significant amount of groundwater/leachate present within the landfill mass. The maximum volume of shallow groundwater (and leachate) discharging to the creek would occur when the tide is low in spring, and was estimated to be 13,930 cubic feet per day (cfd), of which 6,860 cfd was solely groundwater as estimated during the OU-1 pre-final design of the leachate collection system (Appendix J) (Tetra Tech, 2018). The leachate sits directly over the highly-weathered bedrock, or over the 10- to 15-foot thick layers (in total) of sand, gravel, silt, and clay, providing a direct pathway for leachate to migrate to groundwater. The large volume of leachate in the landfill is due to the lack of a landfill cover, which has resulted in infiltration of precipitation. Leachate is continuously generated from precipitation infiltrating through the waste and mixing with groundwater.

Landfill groundwater/leachate contained low to moderate levels of contaminants including inorganics, SVOCs, pesticides, PCBs, dioxins/furans, and perfluorinated compounds. A leachate sample from well MW-11 contained higher concentrations of most contaminants detected than at any other groundwater sampling location. However, the leachate strength was low as compared to typical landfill leachate. Groundwater data indicated the landfill was the primary source of contaminants present at the site. However, landfill groundwater/leachate samples detected low concentrations of VOCs below their respective MCLs. The source of the solvent contamination south of the landfill was not fully identified. It is unknown if this source remains, or if it has the potential to impact leachate. It is possible the original chlorinated solvent source in the landfill may no longer be present (i.e., the source may have been flushed out by the large quantities of precipitation infiltration over the last 40 years), or has been completely transformed and degraded by biological activity.

The selected remedy for the waste, soil, and shallow leachate contamination associated with OU-1 includes installation, maintenance, and monitoring of an evapotranspiration (ET) cover system over the landfill. This cover system will significantly reduce future infiltration of precipitation into the landfill mass, further minimizing potential migration of contaminants from the landfill mass to groundwater.

5.4.3.2 Groundwater Migration

Contaminants of landfill groundwater/leachate are being transported horizontally and vertically, emanating from landfill waste toward Cobbs Creek north of the landfill, Darby Creek west and south of the landfill, and the Eastwick neighborhood east of the landfill. Shallow groundwater flows are primarily within the landfill waste materials and unconsolidated coastal plain sediment, but there is also vertical flow from the shallow aquifer into the deep aquifer along bedrock fractures. Natural gradients are the primary driver for groundwater flow. Contaminants in the deep aquifer appear to flow from landfill toward the Eastwick neighborhood and to the south. Estimates of groundwater flow velocity or travel time was discussed in Section 4.4.

As shown in Figure 4-21, the TCE plume in the deep aquifer appears to migrate in a side gradient direction compared to groundwater flow as displayed in Figure 3-22. Several factors may contribute to the orientation of the TCE deep plume. First, the shape of this plume is approximate based on available data points. The techniques used for generating groundwater elevation contours are mathematical, and can occasionally generate a plume shape that may not be entirely accurate. The deep TCE plume may possibly extend some distance toward well MW-22, but no deep wells exist between wells MW-13I, MW-13D, and MW-19 and well MW-22.

The second factor affecting the TCE plume's pattern may be attributable to underlying fractures. Investigations at the site indicated some fracturing along the historic stream alignment. As TCE is a dense non-aqueous phase liquid (DNAPL), this VOC would have migrated downward during its introduction into the environment and then flowed with groundwater along the dip of the fractures, which may not completely correlate with deep flow controlled by groundwater elevations in the recharge area to the west of the TCE plume.

Data indicated groundwater outside the landfill waste boundary has been impacted by the landfill, as contaminated groundwater exists in the coastal plain aquifer and the bedrock aquifer. The shallow aquifer contains most of the contaminants in landfill groundwater, and levels for most contaminants of concern (except VOCs) decreased significantly within the deep aquifer. In general, relatively high concentrations of contaminants were detected in the Eastwick neighborhood wells located close to the landfill boundary and south of the landfill. Relatively low concentrations of contaminants were detected in deep groundwater outside the landfill boundary.

The mobility of a contaminant is affected by its solubility and partitioning ability. The partition coefficients for PAHs, pesticides, PCBs, dioxins/furans indicate that they are less mobile in groundwater and tend to adhere to soil particles and sediment. Migration with groundwater is not a dominant transport pathway for these large organic molecules. VOCs, 1,4-dioxane, PFOA, and PFOS have high solubilities and low organic carbon coefficients, thereby making them highly susceptible to groundwater transport. The 1,4-dioxane plume originating at the landfill was presumed to represent the approximate extent of groundwater impacts associated with the site.

A significant portion of site groundwater flows east under the Eastwick neighborhood. Sampling results indicated that 1,4-dioxane, PFOA, and PFOS have migrated to the east and south. The 1,4-dioxane plume and the combined PFOA/PFOS plume in shallow aquifer extend eastward to Penrose Plaza Shopping Center, and southward to Korman Residential at International City Chalets (Figures 4-18 and 4-20).

Analytical results also indicated chlorinated VOCs have migrated in a north to south direction. Lower VOC concentrations were present in shallow groundwater south of the landfill (Figure 4-7), while higher levels were contained in deep groundwater south of the landfill (Figure 4-12), including TCE (295 μg/L) and its degradation products. The source of the VOCs appeared to be near the southern edge of the landfill or just outside the landfill boundary. Where present, wastes containing TCE and related solvents may represent a major long-term source of groundwater contamination. Groundwater flowing through contaminated soils can dissolve these solvents and transport them downgradient laterally or vertically. Dissolved TCE, DCE, and VC can migrate readily in groundwater. However, the significant presence of chlorinated VOCs in wastes or soils was not established during the OU-1 RI, and DNAPLs were not encountered in groundwater. The VOC source may have been depleted; however, it is possible for VOCs to diffuse from the deep bedrock if contained in that matrix.

Anaerobic bacteria found in groundwater are frequently able to degrade chlorinated parent compounds into daughter compounds. Under suitable conditions, TCE can anaerobically biodegrade, forming primarily DCE, which may subsequently further biodegrade to vinyl chloride. The reductive dechlorination of TCE to yield ethenes with lower levels of chlorination is mediated by anaerobic bacteria. Biodegradation products have been detected in the groundwater at the site, consistent with existing mild reducing conditions and the presence of organic carbon at low concentrations. However, the presence of nitrates in site groundwater suggests that conditions are not sufficiently reducing to result in complete or rapid degradation of TCE.

5.4.3.3 Groundwater/Leachate to Surface Water Migration

The site is situated on unconsolidated Coastal Plain sediment overlying bedrock of the Wissahickon Formation. Due to the high elevation of the landfill and the apparent high permeability of landfill soil, infiltration has created a mound of groundwater within the landfill that migrates radially off-site. OU-1 RI groundwater-flow modeling indicated a large fraction of landfill groundwater/leachate discharges to Cobbs Creek north of the landfill, and to Darby Creek west and south of the landfill near the S. 84th Street Bridge of Darby Creek.

Creek water is in direct contact with landfill waste at several locations along Darby Creek. Groundwater mixed with leachate is the major source of seeps observed along the embankments of Darby and Cobbs Creeks near the landfill, and the source of oily discharge near the southern industrial area. The concentration of contaminants in leachate/groundwater seepage is diluted by surface water in Darby and Cobbs Creeks.

Pore water results were used to evaluate interactions along the groundwater/surface water interface adjacent to the landfill. Results of landfill groundwater and creek pore water sampling and analysis indicated contaminants of landfill groundwater/leachate were being transported to creek pore water and surface water via groundwater seepage. Groundwater/leachate contaminants transported via this pathway can either become bound in the creek sediment or remain dissolved and move from pore water into surface water. The areal influence of pore water contamination may extend from a few feet to ten times that distance, feet depending on soil types along creek embankments.

For areas outside the landfill boundary and along creeks north and south of the landfill, the influence of pore water contamination is likely smaller due to lower hydraulic conductivity of soils, which reduces the velocity of water moving through this zone. Surface water does not have as much time to move into streambanks at high tide, and groundwater does not have as much time to discharge into the faster creek flows. This creates a narrow barrier in pore water flow along the creeks, where small quantities of surface water and groundwater interact, but neither is significantly flowing into one another.

For areas along the creeks where wastes are present, hydraulic conductivity is higher. This creates a situation where water can be quickly transported into the landfill during high tide, then flow back into the creeks during low tide. However, the mound in the landfill's center exerts pressure on groundwater flow in all directions. Due to significant variations in elevation, groundwater velocity is much faster compared to flatter areas outside the landfill. The faster moving groundwater pushes against surface water influx in the pore water zone, again forming a barrier to prevent surface water's influence too far into the landfill. Given the larger volumes of water and physical forces involved, these factors may create a larger pore water zone in the landfill area, but likely only extends no more than 30 feet.

Due to the heterogeneity of landfill wastes and soil types along the creeks, conditions may allow stronger flows into streambanks, particularly directly through the wastes. These preferential pathways may serve to bypass pore water-influenced areas or zones.

Surface water and landfill leachate seeps were evaluated in the OU-1 RI. For the recreational receptors and the construction worker, no unacceptable human health risks were identified from exposure to surface water, sediment, and landfill leachate seeps. However, unacceptable human health risks were identified for the subsistence fisher and recreational consumers of fish from these creeks. The OU-1 screening-level ecological risk assessment (SLERA) concluded there were no unsafe risks associated with food chain exposure to fish-eating animals from contaminants in tidal riverine surface water; therefore, no bioaccumulation of contaminants was determined to occur in fish tissue. Fish and turtles likely have home ranges that are larger than the edge of the landfill, and thus may be exposed to contamination in other portions of the site and the larger aquatic environment. EPA will conduct an aquatic baseline risk assessment evaluating the entirety of the site (including OU-1 and OU-2) and potential sources of contamination.

The OU-1 SLERA evaluated ecological risks to aquatic biota, such as benthic macroinvertebrates, resulting from direct exposure to contaminated pore water beneath Cobbs and Darby Creeks. Based on toxicity studies, the OU-1 SLERA concluded possible risk to aquatic invertebrates exposed to COPCs in creek sediment existed. It also assessed potential impacts to upper trophic levels that could be caused by impacts to the base of the food chain web. The food chain risks to aquatic feeding birds (e.g., lesser scaup) and mammals (e.g., raccoon) were modeled using dietary exposure concentrations. The substances posing model-calculated food chain risks within the site and landfill seeps included mercury, nickel, selenium, chromium, dibenzofuran, and dieldrin.

The OU-3 SLERA (in Section 6.2) used pore water data to update the ecological risk assessment. This SLERA indicated potential impacts to aquatic organisms exposed to PAHs, pesticides, PCBs, and several metals (i.e., barium, copper, iron, and manganese) in pore water.

5.4.3.4 Groundwater to Air Migration (Vapor Intrusion)

The vapor intrusion (VI) pathway occurs when volatile compounds in contaminated groundwater volatilize beneath a building and diffuse inside the building towards regions of lower chemical concentration. Sub-slab soil vapors can accumulate and enter a structure through cracks and gaps in the basement or foundation of a building (e.g., concrete slab). Contaminated groundwater from the landfill has migrated toward the Eastwick neighborhood.

A groundwater VI model was conducted by EPA as part of the HHRA to determine if VI was a potential pathway of groundwater contaminants into indoor air. Groundwater at the site poses an unacceptable risk to human health because of several contaminants, including TCE, VC, benzene, cyanide, mercury, PCBs, and dioxins. This migration pathway applies to existing homes within the historical landfill footprint and groundwater plume area, as well as any future homes constructed within the plume area.

A residential VI evaluation of certain homes adjacent to the landfill was conducted in 2010-2011 (Tetra Tech, 2012b). VOCs possibly related to the landfill were detected in several air samples collected from various sampling locations. In many instances, it appears the sources for the detected VOCs may not have been related to the site, but rather activities inside of homes and/or the outdoor air. No significant accumulation of any vapors was noted under any structure, nor were any unacceptable human health risks identified (Tetra Tech, 2012a).

6.0 RISK ASSESSMENT

A risk assessment was conducted to evaluate the potential risks to human health and the environment caused by release of contaminants from the landfill into groundwater and pore water in the adjacent creeks. The general objectives of the risk assessment were to estimate the actual or potential risks resulting from the presence of contamination attributable to OU-3, and to provide the information for determining appropriate environmental response actions for groundwater and pore water, if warranted. The specific goals of the risk assessment were to:

- Identify and provide analysis of baseline risks (defined as risks that might exist if no additional remediation or institutional controls were applied at the site) and help determine what action is needed at the site.

- Provide a basis for determining the levels of chemicals that can remain on-site and still do not adversely impact public health and the environment.

- Provide a basis for comparing potential impacts of various remedial alternatives.

The risk assessment results document the magnitude of potential risk at the site and associated cause(s) of that risk. These results may also be used to establish any remedial goals that may be necessary. Finally, the results of the baseline risk assessment will help determine what, if any, remedial response actions may be necessary, and assist with establishing clean-up goals.

Accordingly, the human health risk assessment (HHRA) and ecological risk assessment (ERA) were conducted, and the findings from these assessments are summarized herein. The full versions of the HHRA and ERA are provided in Appendices G and H, respectively.

6.1 HUMAN HEALTH RISK ASSESSMENT

Three major aspects of chemical contamination must be considered when assessing human health risks:

- Contaminants with toxic characteristics must be found in environmental media and must be released either by natural processes or by human action.

- Potential exposure points must exist either at the source or via migration pathways if exposure occurs at a remote location other than the source.

- Human or environmental receptors must be present at the point of exposure.

Risk is a function of both toxicity and exposure; without any one of the three factors listed above, there is no risk. The site-specific potential pathways for contaminant migration and exposure media that provide a potential route of contact with human receptors are illustrated in Figures 6-1 and 6-2.

To assess risks for these contaminant exposure pathways, the HHRA was divided into six components:

- Data evaluation (Section 6.1.1)
- Exposure assessment (Section 6.1.2)
- Toxicity assessment (Section 6.1.3)
- Risk characterization (Section 6.1.4)
- Uncertainty analysis (Section 6.1.5)
- Summary and conclusions (Section 6.1.6)

Each section is summarized below, with additional details and tables presented in Appendix G. The tables associated with the HHRA follow the format adopted by EPA Risk Assessment Guidance for Superfund (RAGS), Volume I, Part D: Standardized Planning, Reporting, and Review of Superfund Risk Assessments (EPA, 2001b).

6.1.1 Data Evaluation

All analytical data used in the risk assessment were validated following EPA data validation procedures (EPA, 2014a, 2014b). Before accepting data for use in the risk assessment, a data quality evaluation was performed. Based upon this review, rejected or blank qualified data were not considered for use in the risk assessment, while estimated values were accepted for use given the indicated uncertainty. Prior to use, the data were adjusted to replace field duplicate pairs with the average of the two concentrations.

6.1.1.1 Selection of Chemicals of Potential Concern

Analytical data for groundwater was screened against EPA RSLs to determine which substances were required for quantitative risk calculation. A substance was selected as a chemical of potential concern (COPC) if the maximum detected concentration in an area of interest exceeded its RSL, corresponding to an estimated lifetime cancer risk probability of one in a million ($1x10^{-6}$) or a noncancer hazard quotient (HQ) of 0.1. RSL criteria for groundwater assume lifetime residential tap water use. Groundwater was separated into three exposure units for evaluation in the HHRA: groundwater inside the landfill, shallow groundwater outside of the landfill, and deep groundwater outside of the landfill. COPCs were selected for each of the four sampling rounds. Appendix G (Part 1), Section 2.3 provides further details and limitations of the procedure used to select COPCs. The COPCs selected for each groundwater area of interest are presented in Appendix G, Part 2 on RAGS D Table 2s, and include a comparison of maximum detected concentrations to RSLs.

COPCs were not selected for pore water. Instead, site-specific RSLs were developed for the intermittent exposure to pore water by recreational receptors and construction worker. The site-specific RSLs were then used to calculate cancer risks and hazard indices for pore water exposures to all detected contaminants at each sampling location. Site-specific RSLs for pore water are presented in Appendix G, Part 12.

6.1.2 Exposure Assessment

The exposure assessment comprises a process for estimating chemical intakes for various receptors based on assumed typical quantities and rates of ingestion or contact with contaminated media, receptor-specific body measurements, and duration and frequency of exposure. Detailed equations and input parameters for each type of receptor and exposure medium are in Appendix G, Part 2 on RAGS D Table 4s. Details regarding receptor exposure parameters are in Appendix G, Part 1, in Section 4.3. Modeled pathways of exposure that involve inter-media transfer from groundwater, such as dermal absorption, volatilization to ambient air, and vapor intrusion are discussed in Appendix G, Part 1, Section 3.2.1, with parameter calculations shown in tables in Appendix G, Parts 5, 6, 8, and 10.

Potential human exposure routes assessed in the HHRA included tap water use of groundwater by future residents; direct contact with groundwater in excavations by construction workers; contact with pore water by recreational users of the creeks and construction workers; inhalation of outdoor vapors emitted from groundwater in open excavations by construction workers and industrial workers; inhalation of outdoor vapors during irrigation by industrial workers, and inhalation of indoor air impacted by vapor intrusion into industrial buildings.

Sample concentrations for COPCs in each data set were utilized collectively to estimate a typical value for the upper range concentrations to which a receptor may be continuously exposed while at or near the site. The estimation of exposure point concentrations (EPCs) provides a statistical procedure for estimating the chemical input for each exposure pathway. The 95% upper confidence limit (UCL) on the mean concentration was used as the input concentration for a chemical to estimate site-associated risks for larger data sets. For each substance, the 95% UCL was calculated using the methods presented in the EPA-approved software program, ProUCL version 5.1.002 (EPA 2016). If there were less than four detected concentrations in a data set, then the maximum detected concentration was selected as the EPC.

As discussed above, groundwater was divided into three exposure units for evaluation in this HHRA. EPCs were calculated for each of the four sampling events at each exposure unit, and the maximum EPC from all four events was used to estimate risks. EPCs are presented in Appendix G, Part 2 in RAGS D Table 3s.

Potential human exposure to pore water by recreational users and construction workers is limited to incidental ingestion and dermal contact because of its intermittent nature. The EPCs for the contaminants in pore water are the actual detected concentrations at each sampling location. Exposure assumptions and EPCs associated with exposure to pore water are presented in Appendix G, Part 12.

Two types of exposure assumptions are possible for use in the HHRA: reasonable maximum exposure (RME) and central tendency exposure (CTE). RME is the exposure that represents a high end, but not usually worst-case, exposure for a given medium of concern. CTE is the exposure that represents a more typical receptor exposure to r a given medium of concern. The input parameters associated with receptor activity patterns and other modeled variables were adjusted to represent central estimates. However, EPCs were assumed to be identical for RME and CTE evaluations.

Exposures to lead in environmental media were evaluated for residential children using EPA's Integrated Exposure Uptake Biokinetic (IEUBK) model (EPA, 2010). This model predicts blood lead levels in a population of lead-exposed children or in the fetus of an adult worker, based on lead biokinetic calculations, which predict quasi-steady state blood lead concentrations in individuals who have relatively steady patterns of lead exposure. Details of the assumptions utilized in lead modeling are discussed in Appendix G, Part 1, in Section 4.4.

6.1.3 Toxicity Assessment

The toxicity assessment identifies the potential health hazards associated with exposure to each COPC. As discussed in Appendix G, Part 1, Section 5, dose-response values [non-cancer reference doses (RfDs), reference concentrations (RfCs), cancer slope factors (CSFs), and inhalation unit risks (IURs)] have been developed by EPA and other sources for many organics and inorganics. RfDs and CSFs associated with oral exposure, and RfCs and IURs associated with inhalation exposure, were obtained from the hierarchy of sources recommended by EPA. Non-cancer toxicity factors are presented in Appendix G, Part 2, in RAGS D Tables 5.1 and 5.2, and included RfDs and RfCs associated with chronic/subchronic effects to particular target organs. CSFs and IURs are presented in Appendix G, Part 2, in RAGS D Tables 6.1 and 6.2.

Dermal exposure CSFs and RfDs were based on extrapolation from oral toxicity values in accordance with EPA RAGS Part E Final Guidance for Dermal Exposure Assessment (EPA, 2004). Appendix G, Part 1, Section 5.0 also discusses chemical-specific toxicity assumptions for chromium, mercury, PAHs, dioxins/furans, vinyl chloride, and the use of toxicity values for chemically similar surrogate compounds if a compound lacked published toxicity values. Lead is regulated by EPA based on blood-lead uptake using a physiology-based pharmacokinetic IEUBK model. Based on residential exposures, lead is screened at 15 µg/L for groundwater and pore water.

6.1.4 Risk Characterization

This section presents estimates of carcinogenic risks, noncarcinogenic hazards, and lead risks for applicable human receptors that are potentially exposed to COPCs identified in each medium within the area of interest. The metric for evaluating cancer risks is based on estimating the probability of cancer occurrence in an exposed population. The criteria for evaluating non-cancer hazards are based on the HQ, which is a unitless number indicating the ratio of estimated dose versus a published threshold value representing a dose above which adverse effects can no longer be ruled out. Lead risks are evaluated based on estimated blood lead concentrations, expressed in micrograms per deciliter (µg/dL), which are predicted for a certain percentage (%) of individuals in an exposed population.

EPA has defined acceptable risks for the sum of cancer risks from all carcinogens as within the range of 10^{-6} and 10^{-4} excess lifetime cancer risk. For non-carcinogens, the benchmark level for acceptable risk is a hazard index (HI) of less than or equal to 1, which represents the sum of the HQs for all compounds affecting the same target organ. For lead, the benchmark level for acceptable risk is a blood lead concentration of 10 µg/dL predicted to be exceeded in no greater than 5% of an exposed population.

A summary of human health risks for each exposure area of interest and receptor follows. Appendix G provides a detailed discussion of chemical-specific risks along with supporting documentation, which includes RAGS D Table 9s (listing risks for all COPCs). Appendix G, Part 2, Table 10s present the risks for a shortened list of contaminants of concern COCs) developed for each area of interest, and included only substances that contribute significantly to human health risks above the target acceptable risk range. A list of COC risk drivers was not applicable if the medium-wide risk was less than the benchmarks discussed earlier. For noncarcinogenic chemicals, the list of COCs included those for which the HQ was greater than 0.1 and, when added to the HQs for other substances affecting the same target organ, yielded a HI value greater than 1. For carcinogenic chemicals, candidate COCs included all substances exhibiting an incremental lifetime cancer risk (ILCR) greater than 1×10^{-6} within the particular exposure pathway. Lead was considered a COC when the model results exceeded the above benchmarks.

Table 6-1 summarizes the total risks for potential receptors exposed to media of concern within the area of interest, and lists COCs contributing to the risks.

Other documentation included in Appendix G are Table 7s, which list the non-cancer and cancer receptor intakes, toxicity values, EPCs, and estimated medium-specific risks for each receptor. Appendix G, Part 9 contains the child lead model (IEUBK) prediction results.

6.1.4.1 Groundwater Risks

A groundwater mound exists in the shallow aquifer under the landfill, resulting in radial flow away from the center of the landfill. Therefore, background monitoring wells could not be identified for shallow groundwater. An upgradient monitoring well cluster consisting of three wells was identified for deep groundwater. However, this well cluster alone did not provide an adequate number of samples to perform a robust background comparison. Consequently, a background comparison could not be performed for groundwater. Also, the concentrations of most chemicals detected in groundwater samples from this well cluster were below screening criteria.

Groundwater inside the Landfill: Exposure to groundwater under the RME scenario was associated with estimated cumulative cancer risks that exceeded or equaled the acceptable risk range for lifetime residents ($1x10^{-2}$), industrial workers ($4x10^{-3}$), and construction workers ($1x10^{-4}$). As summarized in Table 6-1, the major cancer risk drivers with individual cancer risks above $1x10^{-5}$ for the lifetime resident exposed via tap water consumption were 2,3,7,8-TCDD (TCDD) TEQs, chromium, dioxin-like PCBs, nondioxin-like PCBs, arsenic, benzo(a)pyrene, 1,4-dioxane. Additional cancer risk drivers displaying risks between $1x10^{-6}$ and $1x10^{-5}$ were TCE, benzene, aldrin, dieldrin, benzo(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, delta-BHC, pentachlorophenol, bis(2-ethylhexyl)phthalate, beta-BHC, and heptachlor. Collectively, groundwater exposure to the lifetime resident poses the highest risk among the exposure scenarios assessed for groundwater inside the landfill.

For the industrial worker exposed to groundwater under the RME scenario, the major cancer risk drivers with individual cancer risks above $1x10^{-5}$ were TCDD TEQs, dioxin-like PCBs, nondioxin-like PCBs, and chromium. Additional cancer risk drivers displaying risks between $1x10^{-6}$ and $1x10^{-5}$ were 1,4-dioxane, naphthalene, aldrin, dieldrin, and arsenic. Cancer risks for the construction worker were based on a much shorter exposure duration compared to the industrial worker, and were equal to the upper bound of EPA's target risk range.

The maximum of the estimated target organ HIs exceeded 1 for the child resident (HI=205), adult resident (HI=141), construction worker, (HI=62), and industrial worker (HI=65). For the residential receptors, the COCs exhibiting HQs greater than 1 included TCDD TEQs, dioxin-like PCBs, antimony, arsenic, cadmium, chromium, cobalt, cyanide, iron, manganese, mercury, and thallium. Additional COCs contributed to target organ-specific HIs that exceeded 1, but individually were associated with HQs between 0.1 and 1, including zinc, aluminum, TCE, PFOA, PFOS, boron, beryllium, copper, silver, vanadium, 1,4-dioxane, and barium. For the construction workers and industrial workers, the COCs exhibiting HQs greater than 1 included cyanide and TCDD TEQs. Additional COCs that contributed to target organ-specific HIs exceeding 1, but individually were associated with HQs between 0.1 and 1, included TCE and dioxin-like PCBs.

Blood lead concentrations were predicted to exceed 10 μg/dL in 82% of an exposed population of child residents. Blood lead predictions were not able to be generated for construction workers or industrial workers because the adult lead model is not calibrated for groundwater exposure.

Exposure to groundwater under the CTE scenario was associated with estimated cumulative cancer risks that exceeded the acceptable risk range for lifetime residents ($2x10^{-3}$) and industrial workers ($5x10^{-4}$), but not for construction workers ($6x10^{-5}$). As summarized in Table 6-2, the major cancer risk drivers with individual cancer risks above $1x10^{-5}$ for the lifetime resident exposed via tap water consumption were TCDD equivalents, dioxin-like PCBs, chromium, 1,4-dioxane, nondioxin-like PCBs, and arsenic. Additional cancer risk drivers displaying risks between $1x10^{-6}$ and $1x10^{-5}$ were benzo(a)pyrene, aldrin, and dieldrin. Collectively, groundwater exposure for the lifetime resident poses the highest risk among the exposure scenarios assessed for groundwater inside the landfill.

For the industrial worker exposed to groundwater under the CTE scenario, the major cancer risk drivers were TCDD equivalents, dioxin-like PCBs, nondioxin-like PCBs, and chromium. Cancer risks for the construction worker were based on a much shorter exposure duration compared to the industrial worker, and therefore did not exceed $1x10^{-4}$.

The maximum of the estimated target organ HIs exceeded 1 for the child resident (HI=79), adult resident (HI=40), construction worker, (HI=31), and industrial worker (HI=30). For the residential receptors, the COCs exhibiting HQs greater than 1 included TCDD TEQs, dioxin-like PCBs, antimony, arsenic, cyanide, manganese, mercury, and thallium. Additional COCs contributed to target organ-specific HIs that exceeded 1, but individually were associated with HQs between 0.1 and 1, including aluminum, PFOA, PFOS, boron, and vanadium. For construction workers and industrial workers, TCDD TEQs and cyanide were the only COCs exhibiting an HQ greater than 1.

Shallow Groundwater outside the Landfill: Exposure to groundwater under the RME scenario was associated with estimated cumulative cancer risks that exceeded the acceptable risk range for lifetime residents ($1x10^{-3}$), but not for construction workers ($4x10^{-6}$). The estimated cumulative cancer risk for the industrial workers ($1x10^{-4}$) was equal to the upper bound of EPA's target risk range. As summarized in Table 6-1, the major cancer risk drivers with individual cancer risks above $1x10^{-5}$ for the lifetime resident exposed via tap water consumption were arsenic, VC, 2,6-dinitrotoluene, chromium, 1,4-dioxane, 1,2-dibromo-3-chloropropane, and bis(2-chloroethyl)ether. Additional cancer risk drivers displaying risks between $1x10^{-6}$ and $1x10^{-5}$ were benzo(a)pyrene, pentachlorophenol, dieldrin, TCDD TEQs, TCE, benzene, dioxin-like PCBs, 1,2-dichloroethane, and naphthalene. Collectively, groundwater exposure to the lifetime resident poses the highest risk among the exposure scenarios assessed for the shallow groundwater outside the landfill.

The maximum of the estimated target organ HIs exceeded 1 for the child resident (HI=25), adult resident (HI=16), construction worker, (HI=9), and industrial worker (HI=9). For the residential receptors, the COCs exhibiting HQs greater than 1 included 2,6-dinitrotoluene, PFOA, arsenic, cobalt, iron, manganese, thallium, and cyanide. Additional COCs contributed to target organ-specific HIs that exceeded 1, but individually were associated with HQs between 0.1 and 1, including aluminum, DCE, TCE, PFOS, TCDD TEQs, boron, cadmium, and silver. Cyanide was the only COC exhibiting an HQ greater than 1 for the construction worker, and cyanide and manganese were the only COCs exhibiting an HQ greater than 1 for the industrial worker.

Blood lead concentrations were predicted to exceed 10 μg/dL in 35% of an exposed population of child residents. Blood lead predictions were not able to be generated for construction workers or industrial workers because the adult lead model is not calibrated for groundwater exposure.

Estimated cumulative cancer risks for exposure to groundwater under the CTE scenario were exceeded EPA's target risk range for lifetime residents ($3x10^{-4}$), but not for construction workers ($2x10^{-6}$) and industrial workers ($2x10^{-5}$). As summarized in Table 6-2, the major cancer risk drivers with individual cancer risks above $1x10^{-5}$ for the lifetime resident exposed via tap water consumption were arsenic, vinyl chloride, 2,6-dinitrotoluene, and chromium. Additional cancer risk drivers displaying risks between $1x10^{-6}$ and $1x10^{-5}$ were 1,2-dibromo-3-chloropropane, 1,4-dioxane, bis(2-chloroethyl)ether, pentachlorophenol, and dieldrin.

The maximum of the estimated target organ HIs exceeded 1 for the child resident (HI=10), adult resident (HI=5), construction worker, (HI=5), and industrial worker (HI=5) under the CTE scenario. For the residential receptors, the COCs exhibiting HQs greater than 1 included PFOA, arsenic, manganese, and thallium. Additional COCs contributed to target organ-specific HIs that exceeded 1, but individually were associated with HQs between 0.1 and 1, including aluminum and PFOS. For the construction workers and industrial workers, cyanide was the only COC exhibiting an HQ greater than 1.

Deeper Groundwater outside the Landfill: Exposure to groundwater under the RME scenario was associated with estimated cumulative cancer risks that exceeded the acceptable risk range for lifetime residents ($2x10^{-3}$), but not for industrial workers ($8x10^{-5}$). Construction workers are not exposed to deep groundwater outside of the landfill. As summarized in Table 6-1, the major cancer risk drivers with individual cancer risks above $1x10^{-5}$ for the lifetime resident exposed via tap water consumption were chromium, vinyl chloride, TCE, arsenic, and 1,4-dioxane. Additional cancer risk drivers displaying risks between $1x10^{-6}$ and $1x10^{-5}$ were benzo(a)pyrene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, TCDD TEQs, and delta-BHC.

The maximum of the estimated target organ HIs exceeded 1 for the industrial worker (HI = 4), child resident (HI=56) and adult resident (HI=36). For the industrial workers, the COCs exhibiting HQs greater than 1 included cis-1,2-dichloroethene and TCE. For the residential receptors, the COCs exhibiting HQs greater than 1 included cis-1,2-dichloroethene, TCE, aluminum, cobalt, iron, manganese, and cyanide. Additional COCs contributed to target organ-specific HIs that exceeded 1, but individually were associated with HQs between 0.1 and 1, including TCDD TEQs, arsenic, and cadmium.

Blood lead concentrations were predicted to exceed 10 μg/dL in 0.27% of an exposed population of child residents. Blood lead predictions were not able to be generated for industrial workers because the adult lead model is not calibrated for groundwater exposure.

Exposure to groundwater under the CTE scenario was associated with estimated cumulative cancer risks that exceeded the acceptable risk range for lifetime residents ($5x10^{-4}$), but not for industrial workers ($1x10^{-5}$). Construction workers are not exposed to deep groundwater outside of the landfill. As summarized in Table 6-1, the major cancer risk drivers with individual cancer risks above $1x10^{-5}$ for the lifetime resident exposed via tap water consumption were chromium, vinyl chloride, TCE, and arsenic. Additional cancer risk drivers displaying risks between $1x10^{-6}$ and $1x10^{-5}$ were 1,4-dioxane and dibenz(a,h)anthracene.

The maximum of the estimated target organ HIs exceeded 1 for the child resident (HI=22), adult resident (HI=11), and the industrial workers (HQ = 2). For the residential receptors, the COCs exhibiting HQs greater than 1 include 1,2-DCE, TCE, cobalt, and manganese. TCE was the only COC with an HQ greater than 1 for the industrial worker.

6.1.4.2 Risks from Vapor Intrusion

ILCRs for industrial workers and residents exposed to vapor intrusion in a building inside of the landfill and outside of the landfill were within EPA's target risk range. All buildings on the landfill are scheduled to be demolished by EPA as part of the OU-1 remedy.

HIs for industrial workers and residents exposed to vapor intrusion in a building inside the landfill and outside of the landfill exceed 1. Cyanide and mercury were the major contributors to the HI for a building inside the landfill, while cyanide was the major contributor to the HI for a building outside of the landfill.

6.1.4.3 Pore Water Risks

ILCRs and HIs for construction workers, child recreational users, and adult recreational users exposed to pore water were within EPA acceptable levels at all sampling points for all three sampling events.

6.1.5 Uncertainty Analysis

Uncertainties are associated with any risk assessment. Most uncertainties identified for the HHRA will result in potential overestimation of risk for both the RME and CTE scenarios. Further information regarding site-specific risk assessment uncertainties is discussed in Appendix G, Part 1, Section 7.8. The following uncertainties should be considered as part of any risk management decisions for the site:

- Uncertainties Regarding the Estimation of the EPC: Several issues can introduce inaccuracies in the calculation of the EPCs for an area of interest. The EPA software program ProUCL, version 5.1.002 was utilized to estimate 95% UCLs. The uncertainty related to EPCs is associated with UCL calculations based on data sets having very few detected sample results or data sets with too few sample results to allow any statistical calculation of a UCL. This occurred for several COPCs in groundwater. In instances where there were not enough detected sample results to calculate a UCL, the maximum detected concentration was used as the EPC. Using maximum concentration tends to overestimate potential risks for some COPCs, because receptors are assumed to be exposed continuously to the maximum concentration for the entire exposure period. While the use of maximum detected concentrations may result in an overestimation of risk, they do not affect the conclusions of the risk assessment because the EPCs for most COPCs were based on 95% UCLs.

- Uncertainties Associated with Exposure Assessment: The likelihood of the occurrence of the defined exposure scenarios is a source of uncertainty. The future anticipated land use near the landfill is expected to remain as industrial and possibly recreational. Receptors in this HHRA included construction workers, industrial workers, recreational users, and hypothetical residents, so that comprehensive assessment of potential current and future risks from exposures to groundwater could be evaluated. In addition, the exposure assessment includes various models and equations used to estimate exposure doses or contaminant concentrations, and includes several physical parameters that cannot be measured precisely. For example, there is uncertainty associated with using modeled air concentrations (e.g., estimated indoor air and outdoor air breathing zone concentrations as a result of volatile emissions from groundwater) in place of monitored values, as they may not be indicative of actual site conditions during exposure.

- Uncertainties Associated With Toxicity Assessment: Uncertainty is associated with RfDs and CSFs because some values are extrapolated from animal data to humans, carcinogenic effects are extrapolated from laboratory high-dose to the environmental low-dose scenarios, and because interspecies and intraspecies variations occur in toxicological endpoints caused by chemical exposure. The use of EPA RfD values is generally considered to be conservative because the doses are based on no-effect or lowest-observed-effect levels, and then further reduced with uncertainty factors to increase the margin of safety by factors of 10- to 1,000-fold. In most cases, toxicity assessment uncertainties tend to overestimate, rather than underestimate, risks.

- Uncertainties Associated With Lifetime Recreational Exposure: While the long term exposure duration for all potential receptors is highly variable, a conservative approach was to assume that recreational receptors may visit the site over a 30-year period, including six years as a child and 24 years as an adult. Unless the recreational user also happened to be a nearby resident, it would be rather unlikely that most of recreational receptors would frequent the site for that duration. Therefore, lifetime recreational receptor cancer risks may tend to be overestimated.

6.2 ECOLOGICAL RISK ASSESSMENT

This screening level ecological risk assessment (SLERA) was conducted to evaluate the potential for adverse ecological impacts from site-related contamination, and to determine the need for further investigation and/or remedial action at the site. The SLERA contains information to enable scientists and managers to conclude either that ecological risks at the site are most likely negligible or that further information is necessary to evaluate potential ecological risks at the site.

The SLERA was conducted in accordance with EPA Guidance (1997 and 1998) and consists of Steps 1, 2, and part of Step 3 of the eight-step ERA process. The first two screening steps comprise the screening-level ERA, where conservative exposure estimates are compared to screening-level and threshold toxicity values. Step 3 is the first step of a baseline ERA (BERA) and begins with a refinement the conservative assumptions in Steps 1 and 2 to further focus the ERA process on the chemicals of greatest concern at a site. The remainder of Step 3, and Steps 4 through 7 consist of additional site-specific investigations/biological studies, and are conducted if additional evaluations or investigations are necessary. Aspects of Step 8, risk management, are addressed throughout the ERA process, in coordination with EPA BTAG.

A SLERA was conducted in 2006 for Clearview Landfill within the LDCA site (Tetra Tech/Black & Veatch, 2006). The SLERA included, but was not limited to, a risk evaluation of chemical concentrations in Lower Darby Creek surface water/sediment, landfill leachate surface water/sediment, and groundwater. The conclusions of the SLERA were that potential risk to ecological receptors exists from exposure to environmental media at the site. Therefore, a baseline ERA (BERA) was conducted in 2008 for Clearview Landfill (Lockheed Martin, 2008), which included toxicity testing of seep, surface water, and sediment. The conclusions of the BERA were:

- The same COPCs that posed risk to the aquatic plants within the LDCA site posed risk to the aquatic plants at the Upstream Reference Area, as well as Tinicum Marsh and the Impoundment Area.

- Three of six sampling stations within the LDCA site indicated risk to aquatic invertebrates based on reduced survival in the Hyalella azteca toxicity study.

- No acute toxicity to fathead minnow resulted from 96-hour exposure of seep water. However, based upon a comparison of maximum groundwater concentrations to water quality criteria, almost all chemicals retained as COPCs posed risk to aquatic organisms.

- Risk to aquatic feeding birds and mammals was characterized based on dietary exposure models using two receptor species (Lesser scaup and the raccoon). The contaminants which posed model calculated risk within the site and the landfill seeps were the same contaminants that posed risk at the Upstream Reference Area.

Two rounds of sediment pore water samples were collected along the banks of Cobbs Creek and Darby Creek in 2013 (one round in May and the other in September). Numerous inorganic and organic chemicals in the pore water samples were detected at concentrations that exceeded applicable surface water benchmarks, indicating that potential impacts to sediment invertebrates exposed to these chemicals in pore water are possible. This pore water investigation is described in more detail in Section 3.5.4. Due to criteria exceedances of the 2013 pore water data, toxicity data from both the BERA for Clearview Landfill (Lockheed Martin, 2008) and data from the EPA Aquatic Baseline Risk Assessment (Aquatic BRA) for the larger LDCA site, including around OU-2 (Folcroft Landfill), were evaluated in technical memoranda to determine whether these data could be used to further evaluate risks from exposure to pore water (see Appendices H-1 and H-2). The conclusion from the memoranda was that there was uncertainty in using toxicity test data from the BERA because the media sampled for chemical analysis were not collected at the same time as the samples for the toxicity/bioaccumulation tests.

It was also concluded that although sediment toxicity tests were conducted as part of the Aquatic BRA, none of the toxicity tests were conducted in the area adjacent to Clearview Landfill. The memo also indicated that because the 2013 pore water samples were not filtered, and the inorganic results were total concentrations (and not dissolved concentrations), pore water resampling for dissolved metals analysis was recommended because dissolved metals are more representative of the bioavailable portion of the pore water. Therefore, additional pore water samples were collected in 2016 and analyzed for dissolved and total metals. The 2013 pore water data were not used to characterize ecological exposure.

This SLERA used 2013 pore water data for organic chemicals, and 2016 pore water data for metals (the 2016 pore water samples were not analyzed for organic chemicals.) Seep, surface water, and sediment data were previously evaluated in the SLERA (Tetra Tech/Black & Veatch, 2006) and/or BERA (Lockheed Martin, 2008), and were considered in the selection of the OU-1 remedy (EPA, 2014c), which included collection of shallow leachate, so those data were not included in this SLERA. The 2013 pore water metals data were not evaluated in the SLERA, apart from the evaluations included in Appendices H-1 and H-2, and the pore water plots in Appendix H-3. The technical evaluations of the 2013 pore water data are presented in Appendices H-1 and H-2 for informational purposes. Note that a human health evaluation is also included in that memorandum.

6.2.1 <u>Step 1: Screening-Level Problem Formulation</u>

Problem formulation is the first step of a SLERA and consists of identifying the following:

- Ecological resources to be protected (known as assessment endpoints).
- Measurements used to evaluate risks to those resources (known as measurement endpoints).
- Chemicals, geographic areas, and environmental media relevant to the risk assessment.

As part of receptor identification, site habitats and potential ecological receptors (as they apply to ecological risk) are described in the following subsections. A brief summary of the environmental setting and potential sources of contamination and associated exposure pathways is presented below.

6.2.1.1 Environmental Setting

Clearview Landfill and the larger LDCA site are located in the Darby Creek watershed. The watershed of Darby Creek is located predominantly in Delaware County; however, it also includes small portions of Philadelphia and Montgomery Counties. It consists of three planning sub-basins and covers approximately 77 square miles. Darby Creek and its tributaries include an estimated 119 miles of stream.

Land use near Clearview Landfill varies considerably. In general, land use is urban with mixed residential, commercial, industrial, and natural areas. The southern part of Clearview Landfill is industrial/commercial, while the eastern side is recreational and residential.

The primary riverine habitats that are adjacent to the Clearview Landfill include primarily Lower Darby Creek and a section of Cobbs Creek adjacent to the northern portion of the landfill. Each of these systems flow into the Tinicum Marsh area, which is part of the John Heinz NWR. Locally, Cobbs Creek flows into Darby Creek, and Darby Creek flows into the Delaware River. These streams are freshwater and are well upstream of the limits of saltwater (the “salt line”) observed in the Delaware River, which is normally located approximately eight miles downstream. All streams are tidally influenced within the site area (Tetra Tech/Black & Veatch, 2006).

The fish assemblage in Darby and Cobbs Creeks is typical of first to third order streams of the region, dominated by minnows (*Cyprinidae*) and suckers (*Catostomidae*). Sunfishes (*Centrarchidae*) and bullhead catfishes (*Ictaluridae*) are common, as are seasonal migrations of breeding shad (*Clupeidae*) of the Delaware River drainage. Bottom substrates in Darby Creek and Cobbs Creek are mostly gravel and sand with areas of mixed cobble. The width of Darby Creek averages 12 meters (m) wide below the confluence of Darby and Cobbs Creek flowing toward the tidal marsh. Both Darby and Cobbs Creeks are tidal with highly channelized, steep banks. Below the confluence of Darby and Cobbs Creeks, the depth varies with tidal fluctuation from less than 0.3 m during low tide to 2-4 m during high tide. Wooded areas border the riverine habitats at the site and are dominated mainly by river birch (*Betula nigra*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), and sweetgum (*Liquidambar styraciflua*) (Tetra Tech/Black & Veatch, 2006).

6.2.1.2 Potential Exposure Pathways

Chemicals within the groundwater may discharge to Cobbs and Darby Creeks through seeps along the creeks or through the sediment within the creeks. Chemicals in the seep and sediment were evaluated previously (see discussion in Section 6.2) so those media are not evaluated in this SLERA. Aquatic organisms living within the sediment, or directly on the sediment, can be exposed to sediment pore water through direct contact. These would include primarily sediment invertebrates, but could also include fish that nest or burrow in the sediment. Although organisms exposed to pore water can accumulate chemicals in their tissue, and subsequently be consumed by birds and mammals, this pathway was already evaluated in the BERA using site-specific invertebrate bioaccumulation data so it was not evaluated in this SLERA.

6.2.1.3 Preliminary Assessment and Measurement Endpoints

Assessment endpoints are explicit expressions of the environmental value that is to be protected (EPA, 1997). The selection of these endpoints is based on the habitats present, migration pathways of probable contaminants, and relevant exposure routes for the receptors. Measurement endpoints are estimates of measurable biological impacts (e.g., mortality, growth, and reproduction) that are used to evaluate the assessment endpoints. The following presents the assessment and measurement endpoints for the SLERA:

- **Assessment Endpoint:** Adverse effects on the survival, reproduction, and/or growth of aquatic organisms exposed to sediment pore water which was impacted by the release of contaminants from the landfill into groundwater (and subsequently into sediment pore water) in the adjacent creeks.

- **Measurement Endpoint:** Survival, growth, and/or reproduction of aquatic organisms were evaluated by comparing the measured concentrations of chemicals in the sediment pore water to aquatic life water quality toxicity benchmarks.

6.2.1.4 Ecological Conceptual Site Model

The CSM in ERA problem formulation is a written description of predicted relationships between ecological entities and the stressors to which they may be exposed. The CSM consists of two primary components: predicted relationships among stressor, exposure, and assessment endpoint response, and a diagram that illustrates the relationships.

The primary sources of known or potential contamination at the LDCA site are discussed in Section 1.3. Of these sources, the primary source of contamination to Cobbs Creek and Darby Creek in the area of concern are chemicals associated with materials dumped in the Clearview Landfill. Chemicals from the landfill may have migrated into the groundwater which then discharges to Cobbs Creek and Darby Creek through seeps or through the sediment via pore water. For this SLERA, the primary stressors to aquatic organisms are chemicals in sediment pore water. Figure 6-3 represents the ecological CSM for the site.

6.2.2 Step 2: Screening-Level Exposure Estimate and Risk Quotients

6.2.2.1 Ecological Effects Evaluation

The preliminary ecological effects evaluation is an investigation of the relationship between the exposure to a chemical and the potential for adverse effects resulting from exposure. As the first step in the ecological effects evaluation, toxicity thresholds such as ecological screening levels are identified and compiled as discussed below.

Risks to aquatic organisms resulting from direct exposure to chemicals in sediment pore water were evaluated by comparing the chemical concentrations in the sediment pore water to freshwater surface water screening levels. The screening levels, which were considered in the following hierarchy, consisted of the

EPA Region 3 BTAG freshwater surface water benchmarks (EPA, 2006) and EPA Region 4 freshwater surface water screening values (EPA, 2015).

6.2.2.2 Exposure Characterization

Aquatic organisms are exposed to chemicals in the sediment pore water through direct contact. The maximum chemical concentrations in each pore water sample were used in the screening step as the exposure concentration to select COPCs.

May and September 2013 pore water data were used for organic chemicals and the 2016 pore water samples were used for metals. The 2016 pore water data were used for metals because the data are more recent, and because the samples were analyzed for both total and dissolved metals; the 2013 pore water samples were not analyzed for dissolved metals.

6.2.2.3 Risk Characterization

An ecological effects quotient (EEQ) approach was used to characterize the risk to aquatic organisms. This approach characterizes the potential effects by comparing exposure concentrations with the effects data. The EEQs for aquatic organisms are based on the maximum detected chemical concentration in the pore water and are calculated as follows:

$$EEQ = \frac{C_{pw}}{SWSL}$$

Where:

EEQ	=	Ecological effects quotient (unitless)
C_{pw}	=	Maximum chemical concentration in pore water (e.g., µg/L)
SWSL	=	Surface water screening level (e.g., µg/L)

6.2.3 <u>Step 3: Selection of Chemicals of Potential Concern</u>

The final part of the screening evaluation is the selection of ecological COPCs. Chemicals not selected as COPCs are assumed to only cause negligible risk to ecological receptors and were not evaluated further in the ERA. Chemicals initially selected as COPCs were further evaluated in the COPC refinement. The ecological COPCs were selected by the following procedures:

- Chemicals with EEQs greater than 1.0 were selected as COPCs because they have a potential to cause risk to aquatic organisms.

- Chemicals without screening values were selected as COPCs and were further evaluated in the COPC refinement.

- Calcium, magnesium, potassium, and sodium were not selected as COPCs, because they are essential nutrients that can be tolerated by living systems even at high concentrations. No evidence indicates that these chemicals are related to site operations, and they are not considered hazardous chemicals.

Tables 6-3 through 6-10 present the summary statistics, surface water screening levels, EEQs, and individual sample results for the organic chemicals detected in the pore water samples. Table 6-11 presents the summary statistics, surface water screening levels, and EEQs for the metals (total and dissolved) detected in the pore water samples. The sample results and chemical name are shaded black if the EEQ is greater than 1.0 and the chemical is selected as a COPC. Table 6-12 presents a summary of the chemicals initially selected as COPCs because their maximum detected concentrations exceeded their screening level, or because they did not have screening levels.

Several SVOCs (primarily PAHs), pesticides, total PCBs, total dioxin TEQ (fish), and metals were initially selected as COPCs. Therefore, it was recommended that the ERA proceed to the COPC refinement, to better refine the risks to aquatic organisms.

6.2.4 <u>Preliminary COPC Refinement</u>

The preliminary COPC refinement consists of refining the conservative exposure assumptions/concentrations used to evaluate potential risks to ecological receptors, and re-evaluating analytical data using benchmarks that are more appropriate for the assessment endpoints. The objective of the refinement was to better determine which chemicals contribute to potentially unacceptable levels of ecological risk, to identify chemicals of concern (COCs), and to eliminate from further consideration those chemicals initially selected as COPCs but are not likely causing a significant risk.

6.2.4.1 SVOCs

Several SVOCs were detected at concentrations that exceeded their surface water screening levels, all of which were PAHs, except for pentachlorophenol. In addition, four SVOCs (1,4-dioxane, benzaldehyde, caprolactam, carbazole) did not have screening levels.

The only values found for three of the SVOCs without screening levels were Illinois Derived Water Quality Criteria (http://www.epa.illinois.gov/topics/water-quality/standards/derived-criteria/index). Chronic aquatic life criteria were found for 1,4-dioxane (36,000 µg/L), benzaldehyde (14,000 µg/L), and carbazole (7.4 µg/L); no criteria were found for caprolactam. The maximum detected concentrations of 1,4-dioxane (180 µg/L), benzaldehyde (24 µg/L), and carbazole (4.4 µg/L) were lower than the Illinois criteria so adverse impacts to aquatic organisms are not expected. Caprolactum was not detected in the groundwater samples, was not detected in the September 2013 pore water samples; it was only detected in one pore water sample collected in May 2013. Therefore, potential risks to aquatic organisms from caprolactum are not expected to be significant.

Pentachlorophenol was detected in four September 2013 pore water samples, but was not detected in May 2013 pore water samples. Its maximum detected concentration (0.58 µg/L) was only slightly greater than the screening level of 0.5 µg/L; all other detections were less than the screening level. Therefore, potential risks to aquatic organisms from pentachlorophenol are not expected to be significant.

PAH concentrations were much greater (generally by more than one order of magnitude) in the May 2013 samples as compared to the September 2013 samples. As presented in Section 3.5.4, the May 2013 pore water samples were collected using a short piece of slotted PVC pipe driven into the bank, while the September 2013 samples were collected using a driven-screen tool and a peristaltic pump from transects across the creek. Therefore, the May 2013 samples were collected closer to the landfill, and overlying surface water may have mixed with the pore water collected in September 2013 samples. Collection methods may account for the higher PAH concentrations in May 2013.

More non-detects were present in the May 2013 samples, which was probably because of higher detection limits for their analyses. All September 2013 samples were analyzed for PAHs with the SVOC analysis, with some also analyzed for PAHs using the SIM method. This resulted in lower detection limits, but subsequently more detections, than in May 2013. Several detected concentrations of PAHs, in both the May and September 2013 pore water, exceeded the surface water screening levels, so it is possible that aquatic organisms are being impacted by PAHs in pore water.

As indicated in Section 4.2.1.2 of this report, the greatest PAH concentrations were generally found in samples 1602-04 and 1603-04, which were mid-channel and west-bank (opposite side from the landfill) locations, indicating PAHs in pore water may not be related to the landfill.

6.2.4.2 Pesticides/PCBs/Dioxins

Several pesticides were detected in the pore water samples at concentrations that exceeded the surface water benchmarks, the most frequent of which were 4,4'-DDT and alpha-chlordane. The screening levels for several of the pesticides are actually based on risks to receptors through the food chain, and not to aquatic organisms directly (Suter and Tsao, 1996). For example, the screening levels for 4,4-DDT (0.0005 µg/L) and alpha-chlordane (0.0022 µg/L) are final residue values; values to protect aquatic organisms for these two pesticides are 0.013 µg/L and 0.17 µg/L, respectively. Some detected concentrations exceed these aquatic life-based values (although the EEQs would be much lower), so impacts to aquatic organisms from pesticides are possible.

The pore water samples were analyzed for all 209 PCB congeners, and results were summed to calculate total homologue groups and total PCBs. Only the total PCB results were compared to the total PCB screening benchmark (74 pg/L). The total PCB concentrations in all samples exceeded its screening benchmark, which is based on risks to wildlife from exposure through the food chain. The lowest PCB secondary chronic value from Suter and Tsao (1996) based on aquatic life is 0.033 µg/L (33,000 pg/L) for Aroclor-1254. A few detections exceed this aquatic life-based value, so impacts to aquatic organisms from PCBs are possible.

The only dioxin detected in the pore water samples was OCDD. The concentrations in this sample were used to calculate total toxicity equivalent quotients (TEQ) levels for birds, fish, and mammals. The BTAG value for TCDD was used as the screening benchmark, and the concentrations in both samples in which OCDD was detected exceeded that benchmark. The BTAG benchmark is based on risks to wildlife from exposure through the food chain. A more appropriate value for evaluating impacts to aquatic organisms is a water concentration of 0.6 pg/L from EPA (1993) that associates TCDD risks to fish. None of the total TEQ levels for fish exceeded this value, so dioxins are not likely impacting aquatic organisms.

6.2.4.3 Metals

As indicated previously in Section 6.2, pore water samples collected in 2013 were not filtered, so those inorganic results were total concentrations, not dissolved concentrations. Since generally only the dissolved portion of metals in surface/pore water is bioavailable to aquatic organisms, pore water samples were recollected in February 2016 and analyzed for total and dissolved concentrations. Therefore, this section primarily presents the results of the 2016 pore water samples, although the pore water plots in Appendix H-3 present the results of the 2013 and 2016 results for comparison purposes. As discussed above, potential impacts to aquatic organisms are possible from levels of PAHs, pesticides, and PCBs in the pore water. However, the greatest risks are likely to be from metals, as these concentrations exceeded screening levels in most samples.

Table 6-13 presents the detected concentrations of metals for the pore water samples collected in 2016 for chemicals initially selected as COPCs. Results for the 2013 pore water samples are presented in Appendix H-1. On Table 6-13, the sample IDs end in "DM" for dissolved metals or "TM" for total metals and the "-00", "-02", and "-04" at the end of the sample location indicates whether the pore water sample was collected from the surface, from two feet below sediment surface, or from four feet below sediment surface, respectively. The sample locations on Table 6-13 are grouped by samples collected from the eastern side of the creek (the landfill side) and samples collected from the western side of the creek (the opposite side). Cells are shaded black on the table if the concentration exceeds its BTAG surface water screening level.

As can be seen from Table 6-13, every barium detection, and almost all aluminum, iron, and manganese detections exceeded their respective screening levels (for both sides of the creek). Several detections of arsenic, cadmium, copper, and lead, and one detection each for selenium, vanadium, and zinc in the samples collected from the eastern side of the creek exceeded their respective screening levels, but only two exceedances each for copper and lead were collected from the western side of the creek. This indicates that these metals may be related to releases from the landfill, as discussed below in more detail.

Aluminum was not detected in dissolved samples so it is unlikely to have a potential impact on aquatic receptors. Arsenic, cadmium, lead, selenium, vanadium, and zinc were either not detected at concentrations greater than their screening levels in the dissolved samples (lead, vanadium, and zinc), or only slightly exceeded their screening levels in one or two dissolved samples (arsenic, cadmium, and selenium). Therefore, impacts to aquatic receptors from these metals are not likely to be significant.

Appendix H-3 contains plots (Figures 1 through 21) of the 2013 and/or 2016 pore water data for aluminum, barium, copper, iron, and manganese. These metals were selected because, as indicated from Table 6-13, they were the metals whose concentrations exceeded their respective screening levels at the greatest frequency. Figures 1 through 5 in Appendix H-3 show the concentrations of total metals in pore water samples collected from the same locations and depths in 2013 and 2016. With the exception of barium, metal concentrations were greater in 2013 at locations LD103-00, 0303-02, and LD126-00, higher in 2016 at locations 1603-00 and 2503-00, or higher for some metals in 2013 and higher for others in 2016 (i.e., 0301-00 and 2501-00). For barium, the concentrations at every location were either greater in 2013, or similar between the rounds; some of the 2013 results were several times greater than the 2016 results. The reason for the difference in concentrations between sampling rounds and between locations could be differences in sampling methods and sampling locations (refer to Section 3.5.4), which may have resulted in differences in suspended solids levels in the samples. Fluctuations in the groundwater migration pathway due to precipitation events may also have contributed to variability in pore water concentrations over time.

Figures 6 through 9 in Appendix H-3 present the total and dissolved concentrations for barium, copper, iron, and manganese. A figure was not prepared for aluminum since it was not detected in dissolved samples. With only a few exceptions (i.e., PW-0301-04), dissolved metals concentrations were very similar to the total metals concentration, indicating that most of the metals in the samples were dissolved. Total metals concentrations in sample PW-0301-04 had much higher metals concentrations than the dissolved sample from the same location and depth.

Figures 10 through 13 in Appendix H-3 present the dissolved concentrations for barium, copper, iron, and manganese grouped by samples on the landfill side of the creek (eastern bank) and samples on the opposite side of the creek (western bank). In general, greater barium and copper concentrations were detected in samples from the landfill side of the creek, while greater iron and manganese concentrations were detected in samples from the opposite side of the creek. This is further supported in Figures 13 through 17 by concentrations observed in transects across the creek. The two numbers before the dash indicate whether the sample was collected from the landfill side of the creek (01) or the opposite side (03). This evaluation indicates that concentrations of iron and manganese in transects 1601 and 2501 may not be related to releases from the landfill, but concentrations of iron and manganese along transect 030, and concentrations of barium and copper along most transects may be related to releases from the landfill.

Finally, Figures 18 through 21 in Appendix H-3 present the dissolved concentrations by depth. No consistent pattern regarding concentrations at depth were observed from the figures, except than in most cases when the concentrations differed significantly at depth; the highest concentration was in the deepest sample. Locations where greater metals concentrations were found in the deeper samples could indicate that groundwater contamination is a source of the metals at those locations.

Maximum concentrations of dissolved metals, including barium (2,080 µg/L), iron (129,000 µg/L), and manganese (77,000 µg/L) were greater in the groundwater samples than in the pore water samples. The maximum copper concentration in groundwater (39.4 µg/L), however, is lower than several copper concentrations in the pore water samples. Therefore, there is some uncertainty in whether copper concentrations are site-related. The greater metals concentrations in groundwater, along with the observations from the figures in Appendix H-3, indicate that the source of the metals in the pore water, at least at some locations, is groundwater from the landfill. This is not unexpected as the groundwater is known to discharge along the creek.

In summary, the dissolved concentrations of several metals (barium, copper, iron, and manganese) were greater than their respective screening levels in multiple samples and have the potential to impact aquatic receptors at the site. It is likely that barium, iron, and manganese in groundwater is the source of these metals in pore water, at least at some locations. There is uncertainty in whether groundwater copper is the sole source of copper in pore water.

6.2.5 Uncertainty Analysis

This section presents general uncertainties associated with the ERA. The major uncertainties presented here are assessment and measurement endpoints; exposure characterization (whether the receptor actually takes in the constituent); and effects data (use of comparison criteria for similar species and constituents. EPA plans to update the ecological risk assessment for OU-3 as part of future investigations after additional ecotoxicity samples are collected, analyzed, and interpreted. Additional pore water sampling and analysis along with water-level measurements along Cobbs and Darby Creeks are also proposed to support the updated assessment.

6.2.5.1 Uncertainty in Assessment Endpoints and Measurement Endpoints

Measurement endpoints were used to evaluate the assessment endpoints selected for the ERA. For this ERA, the only assessment endpoint evaluated was aquatic organisms living within or in immediate contact with the sediment pore water. Other assessment endpoints were evaluated in previous reports, but there is some uncertainty in whether risks to those endpoints have changed since they were evaluated. Also, risks to aquatic organisms were evaluated by comparing chemical concentrations in pore water to surface water screening levels. There is uncertainty in this evaluation since the organisms could also be evaluated to chemicals via other pathways as well such as sediment ingestion.

6.2.5.2 Uncertainty in Exposure Characterization

Pore water samples were collected at the surface, from two feet below sediment surface, and from four feet below sediment surface. Most aquatic organisms are only exposed to pore water in the surficial layer (i.e., 0-4 inches below the sediment surface) so concentrations in the deeper pore water samples are not representative of current exposure. However, as shown on Figures 18 through 21 in Appendix H-3, metals concentrations generally did not vary at depth, with a few exceptions. Also, because dissolved metals concentrations exceeded screening levels in surficial pore water samples, including deeper pore water samples evaluated in the ERA, this did not change the risk conclusions.

There is uncertainty in whether PAHs, pesticides, and PCBs are dissolved in pore water, and thus more bioavailable, or whether they are bound to sediment particles and less bioavailable. The fact numerous PCBs, pesticides, and PAHs were detected in the pore water samples indicates that the samples likely had some suspended solids, because these organic chemicals are generally not very water soluble.

6.2.5.3 Uncertainty in Ecological Effects Data

Uncertainty exists in several of the screening levels, especially barium and manganese. Due to the relative lack of aquatic toxicity data for these metals, EPA does not have water quality criteria (WQC) established for these metals. The screening levels for barium and manganese were aquatic benchmarks developed for these metals using what is termed as a “Tier II” approach (Suter and Tsao, 1996). This approach is used when there are fewer data than are required to develop EPA recommended water quality criteria. The approach tends to be conservative, and resulted in low screening levels of 4 µg/L for barium and 120 µg/L for manganese.

In comparison, the PADEP Chapter 93 chronic water quality standard for barium is 4,100 µg/L; there is no PADEP chronic water quality standard for manganese. Also, the BTAG screening levels for arsenic (5 µg/L) and iron (300 µg/L), both of which Canadian Guidelines are, are substantially lower than EPA WQC of 150 µg/L and 1,000 µg/L, respectively. However, the BTAG screening levels for arsenic and iron are designed to protect highly sensitive aquatic species, whereas the EPA WQC protects 95% of aquatic species. Thus, tolerant aquatic species may not be at risk, since concentrations did not exceed the EPA WQCs.

6.2.6 Summary and Conclusions

Numerous inorganic and organic chemicals in the pore water samples were detected at concentrations that exceeded their respective surface water screening levels, indicating potential impacts to aquatic organisms exposed to these chemicals in pore water are possible. After further evaluation, PAHs, pesticides, PCBs, and several metals (barium, copper, iron, and manganese) were determined likely to have the greatest potential for impacting the organisms. However, there was uncertainty in whether copper was related to releases to the landfill, and there was considerable uncertainty in the barium screening level. There was also uncertainty in whether PAHs and PCBs are actually dissolved in pore water. PAHs and PCBs are less bioavailable when bound to sediment particles.

Nevertheless, based on this initial SLERA, PAHs (anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, pentachlorophenol, phenanthrene, and pyrene), pesticides

(4,4'-DDD, 4,4'-DDT, alpha-chlordane, beta-BHC, endrin aldehyde, endrin ketone, gamma-BHC [lindane], gamma-chlordane, heptachlor, and heptachlor epoxide), total PCBs, barium, copper, iron, and manganese were retained as COPCs for potential risks to aquatic organisms.

7.0 REFERENCES

Abraham, J. and Others, 2006. Use of a Handheld Broadband FDEM Induction System for Deriving Resistivity Depth Images, *in* Symposium on the Application of Geophysics to Engineering and Environmental Problems, 19. Las Vegas, Nevada, February 10-14, 2002, Proceedings: Denver, Colorado, Environmental and Engineering Geophysical Society.

Aqtesolv, http://www.aqtesolv.com/aquifer-tests/aquifer_properties.htm, accessed 9-17-18

ATSDR (Agency for Toxic Substances and Disease Registry), 1992. ATSDR Toxicological Profile for Boron and Compounds. U.S. Public Health Service, Atlanta, Georgia. July.

ATSDR, 1996. ToxFAQs for Polycyclic Aromatic Hydrocarbons (PAHs). U.S. Public Health Service, Atlanta, Georgia. September.

ATSDR, 1998. ATSDR Toxicological Profiles. U.S. Public Health Service, Atlanta, Georgia.

ATSDR, 2000. Toxicological Profile for Polychlorinated Biphenyls (PCBs). U.S. Public Health Service, Atlanta, Georgia. November.

ATSDR, 2001. Toxicological Profile for Pentachlorophenol (PCP). U.S. Public Health Service, Atlanta, Georgia. September.

ATSDR, 2009. Toxicological Profile for Perfluoroalkyls. U.S. Government Printing Office. http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=1117&tid=237.

Calamari, D. and Barg, U., 1993. Hazard assessment of agricultural chemicals by simple simulation models. In: *Prevention of Water Pollution by Agriculture and Related Activities.*

Cowardin, L. M., 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31. December.

Degnan, J.R., and Brayton, M.J., 2010. Preliminary investigation of paleochannels and groundwater specific conductance using direct-current resistivity and surface-wave seismic geophysical surveys at the Standard Chlorine of Delaware, Inc., Superfund Site, Delaware City, Delaware, 2008: U.S. Geological Survey Open-File Report 2010-1058, 27 p., at http://pubs.usgs.gov/of/2010/1058/.

Degnan, J.R., and Harte, P.T., 2013. Hydrogeologic framework, arsenic distribution, and groundwater geochemistry of glacial-sediment aquifer at the Auburn Road Landfill superfund site, Londonderry, New Hampshire: U.S. Geological Survey Scientific Investigations Report 2013-5123, 58 p., http://pubs.usgs.gov/sir/2013/5123/

Domenico, P.A. and F.W. Schwartz, 1990. Physical and Chemical Hydrogeology, John Wiley & Sons, New York, 824 p.

Environment Canada, 2010. Risk management scope for perfluorooctanoic acid (PFOA), and its salts, and its precursors and long chain (C9 – C20) perfluorcarboxylic acids (PFCAs) and their salts and their precursors. Government of Canada.

EPA (United States Environmental Protection Agency), 1979. Water-Related Environmental Fate of 129 Priority Pollutants. EPA/440/4-79/029. Washington, D.C. December.

EPA, 1982. Aquatic Fate Process Data for Organic Priority Pollutants. December.

EPA, 1984a. Site Analysis, Tinicum Marsh Environmental Center, Folcroft, Pennsylvania. USEPA-EPIC Environmental Photographic Interpretation Center. May. (55 pages).

EPA, 1984b. Clearview Landfill Follow-up Inspection. November 5. (11 pages).

EPA, 1986a. An Investigation of Potential Environmental Hazards at Tinicum National Environmental Center. September. (142 pages) [In conjunction with U.S. Department of the Interior (USDOI) and U.S. Fish and Wildlife Service (USFWS)].

EPA, 1986b. Guidelines for Ground-Water Classification Under the [1984] EPA Ground-Water Protection Strategy, Final Draft November 1986. Office of Ground-Water Protection Publication EPA/440/6-86-007, NTIS Order Number PB88-229067, 135p.

EPA, 1993. Interim Report on Data and Methods for Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risks to Aquatic Life and Associated Wildlife. Office of Research and Development. EPA/600/R-93/055. March.

EPA, 1994. Interim Report on Data and Methods for Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risks to Aquatic Life and Associated Wildlife. Office of Research and Development. EPA/600/R-93/055. March.

EPA, 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final. Environmental Response Team. June 5.

EPA, 1998. Final Guidelines for Ecological Risk Assessment. Risk Assessment Forum, Washington, DC, EPA/630/R095/002F. April.

EPA, 2000. Final Hazard Ranking System Documentation Record, Lower Darby Creek Area, Delaware and Philadelphia Counties, Pennsylvania. April 24.

EPA, 2001a. Federal Register: June 14, 2001. Available at: http://www.epa.gov/reg3hwmd/fr/2001/06/14.htm

EPA, 2001b. Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments). Office of Emergency and Remedial Response. Washington, DC. 9285.7-47. December.

EPA, 2002. Model for subsurface vapor intrusion into buildings. USEPA OSWER guidance based on the work of Johnson and Ettinger (1991) "Johnson, P. C, and R. A. Ettinger. 1991. Heuristic model for predicting the intrusion rate of contaminant vapors in buildings. Environ. Sci. Technol. 25: 1445-1452." Found online at http://www.epa.gov/oswer/riskassessment/airmodel/johnson_ettinger.htm

EPA, 2003. Ecoregions of EPA Region III website. Western Ecology Division. Updated June 13, 2003. Internet website accessed October 5, 2003. Available at: http://www.epa.gov/wed/pages/ecoregions/reg3_eco.htm

EPA, 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment), Final. EPA/540/R/99/005, Office of Emergency and Remedial Response, Washington, D.C., July.

EPA, 2006. Region 3 Freshwater Surface Water Screening Benchmarks. July. http://www.epa.gov/reg3hwmd/risk/eco/btag/sbv/fw/screenbench.htm

EPA, 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwin v 1.1 Build 11). February.

EPA, 2014a. National Functional Guidelines for Superfund Organic Methods Data Review. EPA-540-R-014-002. Office of Superfund Remediation and Technology Innovation (OSRTI). Washington, DC. August.

EPA, 2014b. National Functional Guidelines for Superfund Inorganic Methods Data Review. EPA-540-R-013-001. Office of Superfund Remediation and Technology Innovation (OSRTI). Washington, DC. August.

EPA, 2014c. Record of Decision, Lower Darby Creek Area Superfund Site Operable Unit 1 -Clear View Landfill Soils & Waste, Delaware and Philadelphia Counties, Pennsylvania. September.

EPA, 2015. Region 4 Ecological Risk Assessment Supplemental Guidance, Interim Draft. Scientific Support Section, Superfund Division. August.
https://www.epa.gov/sites/production/files/2015-09/documents/r4_era_guidance_document_draft_final_8-25-2015.pdf

EPA, 2016a. Regional Screening Levels (RSLs). EPA Risk Assessment internet website at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-june-2017. June (earlier versions were also used).

EPA, 2016b. ProUCL Version 5.1.002 User Guide. Office of Research and Development, Washington, D.C. EPA/600/R-07/041. June.

Furl, C. & Meredith, C. (2010). Perfluorinated compounds in Washington rivers and lakes. Washington Department of Ecology. Publication Number 10-03-034. Olympia, Washington.
https://fortress.wa.gov/ecy/publications/summarypages/1003034.html

Gannett Fleming, 1989. Site Investigation Report for the Folcroft Landfill and Tinicum Marsh. Gannett Fleming Environmental Engineers, Inc. September. (184 pages).

Greenman, D.W., Rima, D.R., Lockwood, W.N., and Meisler, H., 1961. Ground-water Resources of the Coastal Plain Area of Southeastern Pennsylvania: Pennsylvania Geological Survey Bulletin W 13, 375 pages, plates.

Hansch, C., A.J. Leo, and D. Hoekman, 1995. Exploring QSAR B Hydrophobic, Electronic, and Steric Constants. Washington, DC: American Chemical Society. (As cited in HSDB, 2004.) HSDB, (Hazardous Substances Data Bank), 2004.

Howard, 1989. Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Volume 1.

Institute of Medicine and National Research Council, 2003. Dioxins and Dioxin-like Compounds in the Food Supply*: Strategies to Decrease Exposure*. Washington, DC: The National Academies Press.

Kearey, P. and M. Brooks, 1991. An introduction to geophysical exploration (2d ed.): Cambridge, Mass., Blackwell Scientific Publications, 254p.

LaGrega, M.D., P.L. Buckingham, and J.C. Evans, 1994. Hazardous Waste Management. McGraw-Hill, New York, NY.

Lockheed Martin, 2008. Baseline Ecological Risk Assessment for Lower Darby Creek Area Site, Clearview Landfill, Philadelphia and Delaware Counties. Edison, NJ.

Loke, M.H., 1999. Electrical Imaging Surveys for Environmental and Engineering Studies – A Practical Guide to 2-D and 3-D Surveys: Penang, Malaysia.

Lyman, W.J., W.F. Reehl, and D.H. Rosenblatt, 1990. Handbook of Chemical Property Estimation Methods. American Chemical Society. Washington, D.C.

McLean, J.E. and B.E. Bledsoe, 1992. Groundwater issue: behavior of metals in soils. EPA/540/S-92/018, U.S. Environmental Protection Agency, Washington, DC.

Morris, D.A. and A.I. Johnson, 1967. Summary of hydrologic and physical properties of rock and soil materials as analyzed by the Hydrologic Laboratory of the U.S. Geological Survey, U.S. Geological Survey Water-Supply Paper 1839-D, 42p.

Nielsen, D.M., 1991. Practical handbook of ground-water monitoring: New York, Lewis Publishers, Inc., 585 p.

OECD (Organization for Economic Cooperation and Development), 2002. Environment Directorate. Hazard assessment of perfluorooctane sulfonate (PFOS) and its salts. www.oecd.org/chemicalsafety/risk-assessment/2382880.pdf

Ongley, E., 1996. Control of water pollution from agriculture - FAO irrigation and drainage paper 55. Food and Agriculture Organization of the United Nations, Rome.

PADCNR (Pennsylvania Department of Conservation and Natural Resources), 2016. Letter Regarding Pennsylvania National Diversity Inventory (PNDI Number: 618658). From Greg Podniesinski, Natural Heritage Section Chief. To Junchul Kim, Project Manager, Tetra Tech. December 19, 2016. (1 page).

PADCNR, 2017. Wild Resource Conservation Fund website. Internet website accessed March 1, 2017. Available at: http://www.dcnr.state.pa.us/wrcf/contents.htm

PADCNR, 2016. Letter correspondence (PNDI Number: 618658) dated December 19, 2016.

PFBC (Pennsylvania Fish and Boat Commission), 2017. Internet website can be accessed at: www.fish.state.pa.us/.

PGC (Pennsylvania Game Commission), 2017. Letter correspondence dated February 6, 2017. (2 Pages). The online PNDI ER Tool can be accessed at www.naturalheritage.state.pa.us

Raven, K.P., A. Jain, and R.H. Loeppert, 1998. Arsenite and arsenate adsorption on ferrihydrite: Kinetic, equilibrium, and adsorption envelopes. Environmental Science and Technology 32:344-349.

Sawyer, C.N. and P.L. McCarty, 1978. Chemistry for environmental engineering (3rd Edition). McGraw-Hill, Inc., USA.

SERDP (Strategic Environmental Research and Development Program), 2012. FY 2014 Statement of need, environmental restoration program area, in-situ remediation of perfluoroalkyl contaminated groundwater. SON Number: ERSON-14-02.
https://www.serdpestcp.org/content/download/15973/182513/version/1/file/FY14+ERSON-14-02+PFOS.pdf

Sigg, L. and W. Stumm, 1981. The interactions of anions and weak acids with the hydrous goethite (α-FeOOH) surface. Colloids Surf. 2: 101-107.

Suter, G.W. II and C.L. Tsao, 1996. Toxicological Benchmarks for Screening Potential Constituents of Concern for Effects on Aquatic Biota: 1996 Revision. Environmental Sciences Division, Oak Ridge National Laboratory. ES/ER/TM-96/R2.

Tetra Tech, 2000. Field Trip Report, Additional Limited Sampling, Lower Darby Creek Area Site, Darby Township, Philadelphia and Delaware Counties, Pennsylvania. April 10. (347 pages).

Tetra Tech, 2001. Trip Report, Lower Darby Creek Area Site - Clearview Landfill, Philadelphia, Philadelphia County, Pennsylvania. March 2. (95 pages).

Tetra Tech and Black & Veatch, 2006. Draft Screening-Level Ecological Risk Assessment Report (Steps 1 through 3 of the ERAGS) for Clearview Landfill within the Lower Darby Creek Area Superfund Site. Project No. 47111-0107. Prepared for U.S. EPA Region 3, Philadelphia, Pennsylvania. May.

Tetra Tech, 2011. Final Remedial Investigation Report, Remedial Investigation and Feasibility Study (RI/FS), Lower Darby Creek Area (LDCA) Site, Delaware and Philadelphia Counties, Pennsylvania. May.

Tetra Tech, 2012a. Indoor Ambient Air Monitoring, Vapor Intrusion Sampling, and Assessment Activities Report for Lower Darby Creek Area Site, Clearview Landfill - Operable Unit 1 (OU-1), Philadelphia and Delaware Counties, Pennsylvania. May.

Tetra Tech, 2012b. Remedial Investigation Report Addendum for Lower Darby Creek Area (LDCA) Site, Clearview Landfill - Operable Unit 1 (OU-1), Philadelphia and Delaware Counties, Pennsylvania. August.

Tetra Tech, 2012c. Site Reconnaissance Report for Lower Darby Creek Area Site, Clearview Landfill - Operable Unit 3 (OU-3). December.

Tetra Tech, 2013a. Sampling and Analysis Plan for Remedial Investigation, Lower Darby Creek Area Site Operable Unit 3 (OU-3), Clearview Landfill - Groundwater. February.

Tetra Tech, 2013b. Final Work Plan for Remedial Investigation, Lower Darby Creek Area Site Operable Unit 3 (OU-3), Clearview Landfill - Groundwater. November.

Tetra Tech, 2018. Final Basis of Design Report (BDR) for Lower Darby Creek Area Superfund Site OU-1, Clearview Landfill. August.

U.S. Census, 2010. U.S. Department of Commerce. Washington, DC. Available at: https://www.census.gov/2010census/data/

USFWS (U.S. Fish and Wildlife Service), 2001. National Wetland Inventory. U.S. Fish and Wildlife Service, found at [http://wetlands2.nwi.fws.gov]. April 2001.

USFWS, 2003. Historical photographs of Folcroft Landfill/Annex provided by the John W. Heinz National Wildlife Refuge at Tinicum, in electronic format CD-ROM.

USGS (U.S. Geological Survey) and Vroblesky, D.A., 2008. User’s Guide to the Collection and Analysis of Tree Cores to Assess the Distribution of Subsurface Volatile Organic Compounds. Scientific Investigations Report 2008-5008. Herndon, VA.

USGS, 2015. Surface Geophysics and Porewater Evaluation at the Lower Darby Creek Area Superfund Site, Philadelphia, Pennsylvania, 2013. Data Series 927. Reston, VA (included as Appendix E-2).

Wilkie, J.A. and J.G. Hering, 1996. Adsorption of arsenic onto hydrous ferric oxide: effects of adsorbate/adsorbent ratios and co-occurring solutes. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 107: 97-110.

Xu, H., B. Allard, and A. Grimvall, 1988. Influence of pH and organic substances on the adsorption of As(V) on geologic materials. Water, Air, and Soil Pollution, 40: 293-305.

Zohdy, A.A.R., G.P. Eaton, and D.R. Mabey, 1974. Application of surface geophysics to groundwater investigations: U.S. Geological Survey Techniques of Water-Resources Investigations, book 2, chap. D1, 86 p.

TABLES

Table 3-1
Water Quality Parameters
(June 2012)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Average Water Quality within Screened Interval of Wells				
	Temperature (Celsius)	ORP (mV)	pH	DO (mg/L)	Conductivity (uS/cm)
MW-01D	14.15	-133	6.90	-0.0030	466.29
MW-01S	15.43	-107	6.71	0.5060	498.01
MW-02	13.10	-25	6.60	1.2905	600.76
MW-03	12.20	-88	6.61	-0.0307	1727.26
MW-04	15.88	-56	6.52	0.0294	1692.41
MW-05D	19.51	-60	6.25	0.0970	759.31
MW-05S	19.46	-66	6.58	0.0340	3150.72
MW-06	19.66	-76	6.68	-0.0088	3506.26
MW-07D	14.95	-27	6.94	0.0442	1837.59
MW-07S	15.35	-62	6.50	0.0771	1802.99
MW-08	Not included due to obstruction				
MW-09	14.17	-126	6.70	-0.0083	423.79
MW-10	Not included due to obstruction				
MW-11	Not included due to lack of water				
MW-12	16.83	-66	6.76	-0.0200	3067.20
MW-13D	13.14	-22	12.11	0.0050	8837.37
MW-13I	13.18	81	11.09	5.0067	701.17
MW-13S	13.05	118	6.55	6.3500	1370.22
MW-14D	13.55	-36	11.88	-0.0700	3015.34
MW-14S	12.71	-160	7.25	0.3844	779.69
MW-15D	15.90	-93	6.74	-0.0564	132.90
MW-15S	15.78	-124	6.85	-0.0588	1559.38
MW-16D	15.31	-230	8.52	-0.0773	260.95
MW-16S	15.36	-47	6.76	0.9800	1340.70
MW-17D	13.47	-5	5.91	2.4110	291.05
MW-17S	12.81	60	5.77	0.1891	286.15
MW-18D	14.22	-101	7.12	-0.0831	230.77
MW-18S	13.68	104	5.25	0.0227	295.60

Table 3-2
Surface Water and Sediment Quality
Site Reconnaissance
Lower Darby Creek Area (LDCA) Site
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Station Location	Date	Surface Water Temperature (°C)	Surface Water pH	Surface Water Conductivity (uS/cm)	Surface Water ORP (mV)	Surface Water DO (mg/L)	Sediment Conductivity (uS/cm)	Distance From Shoreline (feet)	Notes
ST-1	6/4/2012	18.48	6.63	1,345	244	9.78	174.2	0	Sanding Bottom, minimal flow, start of incoming tide (background station)
ST-2	6/4/2012	18.85	7.1	352.2	243	7.96	>999	0	
ST-2	6/4/2012	---	---	---	---	---	177.2	1	
ST-2	6/4/2012	---	---	---	---	---	>999	10	
ST-2	6/4/2012	---	---	---	---	---	>999	20	
ST-2	6/4/2012	---	---	---	---	---	>999	30	
ST-2B	6/4/2012	---	---	---	---	---	138	0	Active seep area
ST-3	6/4/2012	18.91	7.22	244	352.1	8.47	>999	0	
ST-3	6/4/2012	---	---	---	---	---	158.1	10	
ST-3	6/4/2012	---	---	---	---	---	173.7	20	
ST-3	6/4/2012	---	---	---	---	---	>999	30	
ST-3	6/4/2012	---	---	---	---	---	>999	40	
ST-4A	6/5/2012	17.2	7.05	313.7	257	6.77	388	0	East Bank, behind retaining wall, active flowing water, iron bacteria, no identifiable waste
ST-4A	6/5/2012	---	---	---	---	---	187	0	West Bank
ST-4B	6/5/2012	---	---	---	---	---		0	Area of flowing water, not reachable due to water depth
ST-5	6/5/2012	17.35	7.17	312.8	248	6.76		0	Could not reach sediment due to depth of water at low tide, will require a boat to access
ST-6	6/5/2012	17.15	7.18	320.4	240	6.73	166	0	Active bubbling in sediemnt under stream, stream bottom sand and silt. Multiple sediment readings taken in same area
ST-6	6/5/2012	---	---	---	---	---	234	0	
ST-6	6/5/2012	---	---	---	---	---	113.2	0	
ST-6	6/5/2012	---	---	---	---	---	349	0	
ST-6	6/5/2012	---	---	---	---	---	221	0	
ST-7S	6/5/2012	17.41	7.11	326.3	183	6.05	245	0	Area of multiple seeps and bubbling. Conductivity readings taken from ST-7S to ST-7E at 10 foot intervals parallel to bank; strong methane odor noted while walking along embankment
ST-7S	6/5/2012	---	---	---	---	---	305	0	
ST-7S	6/5/2012	---	---	---	---	---	227	0	
ST-7S	6/5/2012	---	---	---	---	---	377	0	
ST-7S	6/5/2012	---	---	---	---	---	388	0	
ST-7S	6/5/2012	---	---	---	---	---	238	0	
ST-7S	6/5/2012	---	---	---	---	---	188	0	
ST-7S	6/5/2012	---	---	---	---	---	341	0	
ST-7S	6/5/2012	---	---	---	---	---	234	0	

Station Location	Date	Surface Water Temperature (°C)	Surface Water pH	Surface Water Conductivity (uS/cm)	Surface Water ORP (mV)	Surface Water DO (mg/L)	Sediment Conductivity (uS/cm)	Distance From Shoreline (feet)	Notes
ST-7S	6/5/2012	---	---	---	---	---	240	0	
ST-7S	6/5/2012	---	---	---	---	---	203	0	
ST-7S	6/5/2012	---	---	---	---	---	176	0	
ST-7S	6/5/2012	---	---	---	---	---	179	0	
ST-7S	6/5/2012	---	---	---	---	---	220	0	
ST-7S	6/5/2012	---	---	---	---	---	217	0	
ST-7S	6/5/2012	---	---	---	---	---	232	0	
ST-7S	6/5/2012	---	---	---	---	---	191	0	
ST-7S	6/5/2012	---	---	---	---	---	180	0	
ST-7S	6/5/2012	---	---	---	---	---	155	0	
ST-7S	6/5/2012	---	---	---	---	---	177	0	
ST-7E	6/5/2012	---	---	---	---	---	486	0	
ST-7E	6/5/2012	---	---	---	---	---	536	5	
ST-7E	6/5/2012	---	---	---	---	---	135	20	
ST-8	6/5/2012	17.09	7.28	339.5	107	7.43	495	0	Flowing pipe noted coming out of embankment, exposed trash noted starting 50 feet south of station to approx. 100 ft north of station; not waste visible on stream bottom
ST-9	6/5/2012	17.17	7.34	335.6	121	7.54	203.3	0	At seep; lost of debris, dumped car in stream, construction debris, gas tanks, active seeps, lots of expsed trash in the stream
ST-9	6/5/2012	---	---	---	---	---	221	0	Downstream of trash
ST-9	6/5/2012	---	---	---	---	---	385	0	50 feet north of trash
ST-10	6/5/2012	17.13	7.35	338.3	135	7.62	412	0	Active seep location just north of saprolite outcrop, iron bacteria forming
ST-11	6/5/2012	17.18	7.38	337.4	138	8.04	724	0	Car in stream, rocky bank, multiple seeps
ST-11	6/5/2012	17.18	7.38	337.4	138	8.04	210	20	
ST-12	6/5/2012	17.32	7.4	338.5	147	7.94	610	0	North edge of seeping outcrop area
ST-13	6/5/2012	17.31	7.42	341	152	7.78	339	0	Active seep, to much waste to get to sheen on embankment
ST-13	6/5/2012	---	---	---	---	---	423	0	75 feet north of station
ST-13	6/5/2012	---	---	---	---	---	345	0	100 feet north of station
ST-14	6/5/2012	17.37	7.48	345.3	155	8.06	316	10	150 long stretch of the stream, dumped boats, cars, and heating oil tank in stream bedd, exposed
ST-15	6/6/2012	17.9	6.85	311.5	188	6.35	161.8	0	Sandy bottome, some visisble trash in the stream, no sheen, no trash on bank
ST-16	6/6/2012	17.6	7.01	308.4	205	6.08	131.7	5	Rocky bank extends approx 75 feet, several seeps, bacterial coloration, truck on bank
ST-16	6/6/2012	---	---	---	---	---	457	0	
ST-16	6/6/2012	---	---	---	---	---	445	0	
ST-17	6/6/2012	---	---	---	---	---	450	0	Small seep on eastern bank, sheen
ST-17	6/6/2012	---	---	---	---	---	327	5	

Table 3-2
Surface Water and Sediment Quality
Site Reconnaissance
Lower Darby Creek Area (LDCA) Site
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Station Location	Date	Surface Water Temperature (°C)	Surface Water pH	Surface Water Conductivity (uS/cm)	Surface Water ORP (mV)	Surface Water DO (mg/L)	Sediment Conductivity (uS/cm)	Distance From Shoreline (feet)	Notes
ST-18	6/6/2012	17.87	7.11	310.2	195	6.45	227	0	Down stream of concrete culvert, adjacent to old retaining wall, sandy bottom

Notes:
---: Data not collected at location
uS/cm: microSiemens per centimeter
mV: millivolts
mg/L: milligrams per liter

Table 3-3a
Groundwater Level Data and Well Inspection Summary
(March 2014)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Top of Casing Elevation (ft msl)	Top of Screen Depth (ft bgs)	Recorded Bottom of Well Screen Depth (ft bgs)	Water Table Elevation			Well Conditions						Well Coordinates	
				Depth to Water (ft bgs)	Water Table Elevation (ft msl)	Measured Total Depth (ft bgs)	Surface Completion	Protective Casing	Riser	Well Pad	Security	Sedimentation	X	Y
MW-01D	13.41	27.00	37.00	13.25	0.16	41.82	Stick up	Rusty	Good	Good	Locked	None	2669105.701	217191.6112
MW-01S	13.67	5.00	15.00	4.33	9.34	19.92	Stick up	Rusty	Good	Good	Locked	None	2669123.113	217196.5786
MW-02	16.02	13.00	23.00	16.11	-0.09	25.74	Stick up	Good	Good	Good	Locked	Minimal	2668976.344	216695.5715
MW-03	5.44	9.75	19.75	8.28	-2.84	22.24	Stick up	Good	Good	Good	Locked	Minimal	2668353.965	216200.2587
MW-04	20.47	14.00	29.00	11.02	9.45	31.37	Stick up	Good	Good	Good	Locked	None	2668459.88	216459.822
MW-05D	20.25	25.00	35.00	19.28	0.97	38.04	Stick up	Good	Good	Not Visible	Locked	None	2667926.368	217215.257
MW-05S	20.29	7.00	17.00	15.34	4.95	19.29	Stick up	Good	Good	Not Visible	Locked	None	2667933.815	217228.474
MW-06	17.61	10.00	20.00	11.04	6.57	21.99	Stick up	Good	Good	Good	Locked	Minimal	2668278.817	217645.142
MW-07D	13.88	22.00	32.00	10.33	3.55	34.42	Stick up	Good	Good	Good	Locked	Minimal	2668574.143	218445.404
MW-07S	13.88	9.50	19.50	11.26	2.62	21.72	Stick up	Good	Good	Good	Locked	Minimal	2668547.793	218461.969
MW-08	13.01	3.53	13.53	8.37	4.64	16.01	Stick up	Good	Good	Good	Locked	Minimal	2669480.042	218882.853
MW-09	18.71	3.00	18.00	10.05	8.66	20.75	Stick up	Good	Good	Good	Locked	None	2669553.923	217959.7361
MW-10	89.43	60.00	80.00	Not included due to obstruction									2668838.457	217744.7621
MW-11	72.78	32.00	52.00	50.24	22.54	52.00	Stick up	Rusty	Good	Good	Locked	Minimal	2668552.334	217310.216
MW-12	21.45	10.00	30.00	9.33	12.12	32.18	Stick up	Good	Good	Good	Locked	None	2668569.106	216841.054
MW-13D	17.06	120	130	57.40	-40.34	126.18	Stick up	Good	Good	Good	Locked	None	2668662.96	215647.80
MW-13I	16.97	60	70	15.51	1.46	70.12	Stick up	Good	Good	Good	Locked	Minimal	2668662.96	215647.80
MW-13S	17.26	20	30	16.97	0.29	30.54	Stick up	Good	Good	Good	Locked	None	2668672.43	215650.98
MW-14D	12.93	122.5	132.5	8.90	4.03	133.08	Stick up	Good	Good	Good	Locked	Minimal	2669511.50	218757.92
MW-14S	14	15	25	11.86	2.14	26.19	Stick up	Good	Good	Good	Locked	Some	2669515.35	218746.96
MW-15D	15.47	263	273	16.71	-1.24	277.00	Flush	Good	Good	Good	Bolted	None	2669703.47	217761.93
MW-15S	15.92	19	29	16.93	-1.01	28.14	Flush	Good	Good	Good	Bolted	Some	2669709.50	217760.75
MW-16D	12.15	160	170	13.87	-1.72	166.75	Flush	Good	Good	Good	Bolted	None	2669658.27	217109.39
MW-16S	12.27	20	30	14.22	-1.95	29.20	Flush	Good	Good	Good	Bolted	None	2669652.73	217117.58
MW-17D	22.33	95	105	10.13	12.20	109.41	Stick up	Good	Loose	Good	Locked	None	2667467.50	216998.77
MW-17S	22.43	15	25	5.57	16.86	26.22	Stick up	Good	Good	Good	Locked	Some	2667469.47	217004.59
MW-18D	13.74	215	225	7.12	6.62	233.34	Stick up	Good	Good	Good	Locked	None	2668733.53	218882.00
MW-18S	13.89	15	25	7.13	6.76	24.38	Stick up	Good	Good	Good	Locked	Some	2668743.15	218882.95
MW-19	18.31	90	100	16.93	1.38	102.60	Stick up	Good	Good	Good	Locked	None	2668750.911	215899.146
MW-20D	32.94	237	247	30.73	2.21	254.00	Stick up	Good	Good	Good	Locked	None	2668110.7	216811.057
MW-20I	32.97	185	195	30.60	2.37	195.00	Stick up	Good	Good	Good	Locked	None	2668110.7	216811.057
MW-20S	33.04	130	140	30.51	2.53	140.00	Stick up	Good	Good	Good	Locked	None	2668115.534	216812.399
MW-21D	17.86	80	90	17.63	0.23	90.00	Stick up	Good	Good	Good	Locked	Minimal	2668389.615	214906.884
MW-21S	17.95	40	50	17.48	0.47	50.00	Stick up	Good	Good	Good	Locked	None	2668389.615	214906.884
MW-22	10.01	90	100	14.62	-4.61	100.00	Flush	Good	Good	Good	Bolted	None	2669532.925	215439.275
MW-23D	25.93	140	150	6.60	19.33	150.00	Stick up	Good	Good	Good	Locked	None	2666695.637	217119.891
MW-23I	25.85	85	95	2.36	23.49	95.00	Stick up	Good	Good	Good	Locked	None	2666695.637	217119.891
MW-23S	25.88	40	50	0.00	25.88	50.00	Stick up	Good	Good	Good	Locked	None	2666695.637	217119.891
MW-24	13.29	15	20	8.00	5.29	22.40	Stick up	Good	Good	Good	Locked	None	2667802.624	215178.711
MW-25	16.01	20	25	11.23	4.78	24.46	Flush	Good	Good	Good	Bolted	None	2667938.419	215364.217
MW-26D	13.83	12	17	13.29	0.54	17.00	Stick up	Good	Good	Good	Locked	None	2668242.169	214923.67

Table 3-3a
Groundwater Level Data and Well Inspection Summary
(March 2014)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Top of Casing Elevation (ft msl)	Top of Screen Depth (ft bgs)	Recorded Bottom of Well Screen Depth (ft bgs)	Water Table Elevation			Well Conditions						Well Coordinates	
				Depth to Water (ft bgs)	Water Table Elevation (ft msl)	Measured Total Depth (ft bgs)	Surface Completion	Protective Casing	Riser	Well Pad	Security	Sedimentation	X	Y
MW-26S	13.98	5	10	9.75	4.23	12.90	Stick up	Good	Good	Good	Locked	None	2668244.256	214930.035
MW-27	13.12	15	20	13.79	-0.67	20.00	Stick up	Good	Good	Good	Locked	None	2668403.411	214497.49
MW-28	5.1	15	20	13.37	-8.27	20.00	Flush	Good	Good	Good	Bolted	None	2670951.282	217010.408
MW-29	6.77	18	23	16.77	-10.00	22.54	Flush	Good	Good	Good	Bolted	None	2671864.029	217477.336
MW-30	6.21	18	23	16.22	-10.01	22.55	Flush	Good	Good	Good	Bolted	None	2671914.721	217241.724
MW-31	4.81	19	24	13.50	-8.69	24.00	Flush	Good	Good	Good	Bolted	None	2672266.542	215889.31
MW-32	4.81	18	23	14.92	-10.11	22.88	Flush	Good	Good	Good	Bolted	None	2672545.806	216611.672
MW-33	7.75	15	20	11.75	-4.00	16.36	Flush	Good	Good	Good	Bolted	None	2668957.043	214305.393
MW-34D	16.64	27	32	16.17	0.47	32.00	Stick up	Good	Good	Good	Locked	None	2669131.936	218366.373
MW-34S	16.49	7	12	5.40	11.09	12.00	Stick up	Good	Good	Good	Locked	None	2669134.409	218368.847
MW-35	2.41	14	19	8.30	-5.89	19.00	Flush	Good	Good	Good	Bolted	None	2670210.283	214981.684
MW-36	9.21	9	14	10.11	-0.90	15.60	Stick up	Good	Good	Good	Locked	None	2668791.27	216621.98
MW-37	16.72	14	19	12.97	3.75	20.08	Stick up	Good	Good	Good	Locked	None	2668638.179	216281.203
MW-38	17.34	18.5	23.5	15.53	1.81	24.50	Stick up	Good	Good	Good	Locked	None	2668748.533	215905.281
MW-39	23.82	23.5	28.5	22.50	1.32	28.20	Stick up	Good	Good	Good	Locked	None	2668987.526	215284.234
MW-40	3.31	13	18	10.11	-6.80	18.00	Flush	Good	Good	Good	Bolted	None	2670809.301	215506.83
MW-41D	14.97	27	32	16.86	-1.89	31.00	Flush	Good	Good	Good	Bolted	None	2669417.49	217276.378
MW-41S	15.05	6.5	11.5	8.55	6.50	10.50	Flush	Good	Good	Good	Bolted	None	2669411.069	217271.48
MW-42	6.91	19	24	15.03	-8.12	23.00	Flush	Good	Good	Good	Bolted	None	2670664.747	217304.473
MW-43	4.25	15	20	12.72	-8.47	19.41	Flush	Good	Good	Good	Bolted	None	2671325.359	216587.611
MW-44	12.26	24	29	17.78	-5.52	29.00	Flush	Good	Good	Good	Bolted	None	2669954.454	214286.192
MW-45	16.69	14	19	16.37	0.32	18.24	Flush	Good	Good	Good	Bolted	None	2669299.512	216201.871
MW-46	2.76	15	20	9.40	-6.64	19.30	Flush	Good	Good	Good	Bolted	None	2670339.039	216221.325
MW-47	5.43	19	24	15.67	-10.24	23.44	Flush	Good	Good	Good	Bolted	None	2672649.258	216428.58

Table 3-3b
Groundwater Level Data and Well Inspection Summary
(December 2014)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Top of Casing Elevation (ft msl)	Top of Screen Depth (ft bgs)	Recorded Bottom of Well Screen Depth (ft bgs)	Water Table Elevation			Well Conditions						Well Coordinates	
				Depth to Water (ft bgs)	Water Table Elevation (ft msl)	Measured Total Depth (ft bgs)	Surface Completion	Protective Casing	Riser	Well Pad	Security	Sedimentation	X	Y
MW-01D	13.41	27.00	37.00	14.40	-0.99	41.82	Stick up	Rusty	Good	Good	Locked	None	2669105.701	217191.6112
MW-01S	13.67	5.00	15.00	6.65	7.02	19.92	Stick up	Rusty	Good	Good	Locked	None	2669123.113	217196.5786
MW-02	16.02	13.00	23.00	18.00	-1.98	25.74	Stick up	Good	Good	Good	Locked	Minimal	2668976.344	216695.5715
MW-03	5.44	9.75	19.75	6.70	-1.26	22.24	Stick up	Good	Good	Good	Locked	Minimal	2668353.965	216200.2587
MW-04	20.47	14.00	29.00	12.67	7.80	31.37	Stick up	Good	Good	Good	Locked	None	2668459.88	216459.822
MW-05D	20.25	25.00	35.00	19.38	0.87	38.04	Stick up	Good	Good	Not Visible	Locked	None	2667926.368	217215.257
MW-05S	20.29	7.00	17.00	16.24	4.05	19.29	Stick up	Good	Good	Not Visible	Locked	None	2667933.815	217228.474
MW-06	17.61	10.00	20.00	11.92	5.69	21.99	Stick up	Good	Good	Good	Locked	Minimal	2668278.817	217645.142
MW-07D	13.88	22.00	32.00	11.27	2.61	34.42	Stick up	Good	Good	Good	Locked	Minimal	2668574.143	218445.404
MW-07S	13.88	9.50	19.50	12.24	1.64	21.72	Stick up	Good	Good	Good	Locked	Minimal	2668547.793	218461.969
MW-08	13.01	3.53	13.53	10.00	3.01	16.01	Stick up	Good	Good	Good	Locked	Minimal	2669480.042	218882.853
MW-09	18.71	3.00	18.00	12.54	6.17	20.75	Stick up	Good	Good	Good	Locked	None	2669553.923	217959.7361
MW-10	89.43	60.00	80.00	Not included due to obstruction									2668838.457	217744.7621
MW-11	72.78	32.00	52.00	52.55	20.23	52.00	Stick up	Rusty	Good	Good	Locked	Minimal	2668552.334	217310.216
MW-12	21.45	10.00	30.00	11.29	10.16	32.18	Stick up	Good	Good	Good	Locked	None	2668569.106	216841.054
MW-13D	17.06	120	130	15.90	1.16	126.18	Stick up	Good	Good	Good	Locked	None	2668662.96	215647.80
MW-13I	16.97	60	70	17.62	-0.65	70.12	Stick up	Good	Good	Good	Locked	Minimal	2668662.96	215647.80
MW-13S	17.26	20	30	17.72	-0.46	30.54	Stick up	Good	Good	Good	Locked	None	2668672.43	215650.98
MW-14D	12.93	122.5	132.5	12.30	0.63	133.08	Stick up	Good	Good	Good	Locked	Some	2669511.50	218757.92
MW-14S	14	15	25	13.15	0.85	26.19	Stick up	Good	Good	Good	Locked	Some	2669515.35	218746.96
MW-15D	15.47	263	273	17.75	-2.28	277.00	Flush	Good	Good	Good	Bolted	None	2669703.47	217761.93
MW-15S	15.92	19	29	17.83	-1.91	28.14	Flush	Good	Good	Good	Bolted	Some	2669709.50	217760.75
MW-16D	12.15	160	170	14.86	-2.71	166.75	Flush	Good	Good	Good	Bolted	None	2669658.27	217109.39
MW-16S	12.27	20	30	15.27	-3.00	29.20	Flush	Good	Good	Good	Bolted	None	2669652.73	217117.58
MW-17D	22.33	95	105	15.00	7.33	109.41	Stick up	Good	Loose	Good	Locked	None	2667467.50	216998.77
MW-17S	22.43	15	25	13.41	9.02	26.22	Stick up	Good	Good	Good	Locked	Some	2667469.47	217004.59
MW-18D	13.74	215	225	8.19	5.55	233.34	Stick up	Good	Good	Good	Locked	None	2668733.53	218882.00
MW-18S	13.89	15	25	8.75	5.14	24.38	Stick up	Good	Good	Good	Locked	Some	2668743.15	218882.95
MW-19	18.31	90	100	18.98	-0.67	102.60	Stick up	Good	Good	Good	Locked	None	2668750.911	215899.146
MW-20D	32.94	237	247	31.93	1.01	254.00	Stick up	Good	Good	Good	Locked	None	2668110.7	216811.057
MW-20I	32.97	185	195	31.10	1.87	195.00	Stick up	Good	Good	Good	Locked	None	2668110.7	216811.057
MW-20S	33.04	130	140	31.41	1.63	140.00	Stick up	Good	Good	Good	Locked	None	2668115.534	216812.399
MW-21D	17.86	80	90	19.10	-1.24	90.00	Stick up	Good	Good	Good	Locked	Minimal	2668389.615	214906.884
MW-21S	17.95	40	50	19.09	-1.14	50.00	Stick up	Good	Good	Good	Locked	None	2668389.615	214906.884
MW-22	10.01	90	100	16.42	-6.41	100.00	Flush	Good	Good	Good	Bolted	None	2669532.925	215439.275
MW-23D	25.93	140	150	12.08	13.85	150.00	Stick up	Good	Good	Good	Locked	None	2666695.637	217119.891
MW-23I	25.85	85	95	5.54	20.31	95.00	Stick up	Good	Good	Good	Locked	None	2666695.637	217119.891
MW-23S	25.88	40	50	0.70	25.18	50.00	Stick up	Good	Good	Good	Locked	None	2666695.637	217119.891
MW-24	13.29	15	20	9.65	3.64	22.40	Stick up	Good	Good	Good	Locked	None	2667802.624	215178.711
MW-25	16.01	20	25	11.85	4.16	24.46	Flush	Good	Good	Good	Bolted	None	2667938.419	215364.217
MW-26D	13.83	12	17	14.90	-1.07	17.00	Stick up	Good	Good	Good	Locked	None	2668242.169	214923.67

Table 3-3b
Groundwater Level Data and Well Inspection Summary
(December 2014)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Top of Casing Elevation (ft msl)	Top of Screen Depth (ft bgs)	Recorded Bottom of Well Screen Depth (ft bgs)	Water Table Elevation			Well Conditions						Well Coordinates	
				Depth to Water (ft bgs)	Water Table Elevation (ft msl)	Measured Total Depth (ft bgs)	Surface Completion	Protective Casing	Riser	Well Pad	Security	Sedimentation	X	Y
MW-26S	13.98	5	10	10.12	3.86	12.90	Stick up	Good	Good	Good	Locked	None	2668244.256	214930.035
MW-27	13.12	15	20	14.85	-1.73	20.00	Stick up	Good	Good	Good	Locked	None	2668403.411	214497.49
MW-28	5.1	15	20	15.25	-10.15	20.00	Flush	Good	Good	Good	Bolted	None	2670951.282	217010.408
MW-29	6.77	18	23	18.01	-11.24	22.54	Flush	Good	Good	Good	Bolted	None	2671864.029	217477.336
MW-30	6.21	18	23	17.51	-11.30	22.55	Flush	Good	Good	Good	Bolted	None	2671914.721	217241.724
MW-31	4.81	19	24	15.25	-10.44	24.00	Flush	Good	Good	Good	Bolted	None	2672266.542	215889.31
MW-32	4.81	18	23	16.30	-11.49	22.88	Flush	Good	Good	Good	Bolted	None	2672545.806	216611.672
MW-33	7.75	15	20	13.68	-5.93	16.36	Flush	Good	Good	Good	Bolted	None	2668957.043	214305.393
MW-34D	16.64	27	32	16.90	-0.26	32.00	Stick up	Good	Good	Good	Locked	None	2669131.936	218366.373
MW-34S	16.49	7	12	7.20	9.29	12.00	Stick up	Good	Good	Good	Locked	None	2669134.409	218368.847
MW-35	2.41	14	19	11.00	-8.59	19.00	Flush	Good	Good	Good	Bolted	None	2670210.283	214981.684
MW-36	9.21	9	14	12.31	-3.10	15.60	Stick up	Good	Good	Good	Locked	None	2668791.27	216621.98
MW-37	16.72	14	19	15.31	1.41	20.08	Stick up	Good	Good	Good	Locked	None	2668638.179	216281.203
MW-38	17.34	18.5	23.5	17.84	-0.50	24.50	Stick up	Good	Good	Good	Locked	None	2668748.533	215905.281
MW-39	23.82	23.5	28.5	24.56	-0.74	28.20	Stick up	Good	Good	Good	Locked	None	2668987.526	215284.234
MW-40	3.31	13	18	12.62	-9.31	18.00	Flush	Good	Good	Good	Bolted	None	2670809.301	215506.83
MW-41D	14.97	27	32	17.92	-2.95	31.00	Flush	Good	Good	Good	Bolted	None	2669417.49	217276.378
MW-41S	15.05	6.5	11.5	9.80	5.25	10.50	Flush	Good	Good	Good	Bolted	None	2669411.069	217271.48
MW-42	6.91	19	24	16.63	-9.72	23.00	Flush	Good	Good	Good	Bolted	None	2670664.747	217304.473
MW-43	4.25	15	20	14.65	-10.40	19.41	Flush	Good	Good	Good	Bolted	None	2671325.359	216587.611
MW-44	12.26	24	29	20.04	-7.78	29.00	Flush	Good	Good	Good	Bolted	None	2669954.454	214286.192
MW-45	16.69	14	19	Not included due to Dry Well									2669299.512	216201.871
MW-46	2.76	15	20	11.51	-8.75	19.30	Flush	Good	Good	Good	Bolted	None	2670339.039	216221.325
MW-47	5.43	19	24	17.17	-11.74	23.44	Flush	Good	Good	Good	Bolted	None	2672649.258	216428.58

Table 3-3c
Groundwater Level Data and Well Inspection Summary
(July 2015)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

				Water Table Elevation			Well Conditions						Well Coordinates	
Well Number	Top of Casing Elevation (ft msl)	Top of Screen Depth (ft bgs)	Recorded Bottom of Well Screen Depth (ft bgs)	Depth to Water (ft bgs)	Water Table Elevation (ft msl)	Measured Total Depth (ft bgs)	Surface Completion	Protective Casing	Riser	Well Pad	Security	Sedimentation	X	Y
MW-01D	13.41	27.00	37.00	14.00	-0.59	41.82	Stick up	Rusty	Good	Good	Locked	None	2669105.701	217191.6112
MW-01S	13.67	5.00	15.00	5.90	7.77	19.92	Stick up	Rusty	Good	Good	Locked	None	2669123.113	217196.5786
MW-02	16.02	13.00	23.00	17.17	-1.15	25.74	Stick up	Good	Good	Good	Locked	Minimal	2668976.344	216695.5715
MW-03	5.44	9.75	19.75	8.62	-3.18	22.24	Stick up	Good	Good	Good	Locked	Minimal	2668353.965	216200.2587
MW-04	20.47	14.00	29.00	11.41	9.06	31.37	Stick up	Good	Good	Good	Locked	None	2668459.88	216459.822
MW-05D	20.25	25.00	35.00	17.82	2.43	38.04	Stick up	Good	Good	Not Visible	Locked	None	2667926.368	217215.257
MW-05S	20.29	7.00	17.00	16.96	3.33	19.29	Stick up	Good	Good	Not Visible	Locked	None	2667933.815	217228.474
MW-06	17.61	10.00	20.00	11.47	6.14	21.99	Stick up	Good	Good	Good	Locked	Minimal	2668278.817	217645.142
MW-07D	13.88	22.00	32.00	11.25	2.63	34.42	Stick up	Good	Good	Good	Locked	Minimal	2668574.143	218445.404
MW-07S	13.88	9.50	19.50	12.26	1.62	21.72	Stick up	Good	Good	Good	Locked	Minimal	2668547.793	218461.969
MW-08	13.01	3.53	13.53	Obstructed		16.01	Stick up	Good	Good	Good	Locked	Minimal	2669480.042	218882.853
MW-09	18.71	3.00	18.00	9.78	8.93	20.75	Stick up	Good	Good	Good	Locked	None	2669553.923	217959.7361
MW-10	89.43	60.00	80.00	Not included due to obstruction									2668838.457	217744.7621
MW-11	72.78	32.00	52.00	52.50	20.28	52.00	Stick up	Rusty	Good	Good	Locked	Minimal	2668552.334	217310.216
MW-12	21.45	10.00	30.00	10.88	10.57	32.18	Stick up	Good	Good	Good	Locked	None	2668569.106	216841.054
MW-13D	17.06	120	130	18.21	-1.15	126.18	Stick up	Good	Good	Good	Locked	None	2668662.96	215647.80
MW-13I	16.97	60	70	16.36	0.61	70.12	Stick up	Good	Good	Good	Locked	Minimal	2668662.96	215647.80
MW-13S	17.26	20	30	17.78	-0.52	30.54	Stick up	Good	Good	Good	Locked	None	2668672.43	215650.98
MW-14D	12.93	122.5	132.5	10.17	2.76	133.08	Stick up	Good	Good	Good	Locked	Some	2669511.50	218757.92
MW-14S	14	15	25	12.20	1.80	26.19	Stick up	Good	Good	Good	Locked	Some	2669515.35	218746.96
MW-15D	15.47	263	273	17.42	-1.95	277.00	Flush	Good	Good	Good	Bolted	None	2669703.47	217761.93
MW-15S	15.92	19	29	17.75	-1.83	28.14	Flush	Good	Good	Good	Bolted	Some	2669709.50	217760.75
MW-16D	12.15	160	170	14.60	-2.45	166.75	Flush	Good	Good	Good	Bolted	None	2669658.27	217109.39
MW-16S	12.27	20	30	15.02	-2.75	29.20	Flush	Good	Good	Good	Bolted	None	2669652.73	217117.58
MW-17D	22.33	95	105	13.40	8.93	109.41	Stick up	Good	Loose	Good	Locked	None	2667467.50	216998.77
MW-17S	22.43	15	25	10.74	11.69	26.22	Stick up	Good	Good	Good	Locked	Some	2667469.47	217004.59
MW-18D	13.74	215	225	7.92	5.82	233.34	Stick up	Good	Good	Good	Locked	None	2668733.53	218882.00
MW-18S	13.89	15	25	7.92	5.97	24.38	Stick up	Good	Good	Good	Locked	Some	2668743.15	218882.95
MW-19	18.31	90	100	17.70	0.61	102.60	Stick up	Good	Good	Good	Locked	None	2668750.911	215899.146
MW-20D	32.94	237	247	31.37	1.57	254.00	Stick up	Good	Good	Good	Locked	None	2668110.7	216811.057
MW-20I	32.97	185	195	31.27	1.70	195.00	Stick up	Good	Good	Good	Locked	None	2668110.7	216811.057
MW-20S	33.04	130	140	31.57	1.47	140.00	Stick up	Good	Good	Good	Locked	None	2668115.534	216812.399
MW-21D	17.86	80	90	18.31	-0.45	90.00	Stick up	Good	Good	Good	Locked	Minimal	2668389.615	214906.884
MW-21S	17.95	40	50	18.19	-0.24	50.00	Stick up	Good	Good	Good	Locked	None	2668389.615	214906.884
MW-22	10.01	90	100	15.44	-5.43	100.00	Flush	Good	Good	Good	Bolted	None	2669532.925	215439.275
MW-23D	25.93	140	150	10.26	15.67	150.00	Stick up	Good	Good	Good	Locked	None	2666695.637	217119.891
MW-23I	25.85	85	95	4.65	21.20	95.00	Stick up	Good	Good	Good	Locked	None	2666695.637	217119.891
MW-23S	25.88	40	50	0.86	25.02	50.00	Stick up	Good	Good	Good	Locked	None	2666695.637	217119.891
MW-24	13.29	15	20	8.35	4.94	22.40	Stick up	Good	Good	Good	Locked	None	2667802.624	215178.711
MW-25	16.01	20	25	10.77	5.24	24.46	Flush	Good	Good	Good	Bolted	None	2667938.419	215364.217
MW-26D	13.83	12	17	13.82	0.01	17.00	Stick up	Good	Good	Good	Locked	None	2668242.169	214923.67

Table 3-3c
Groundwater Level Data and Well Inspection Summary
(July 2015)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Top of Casing Elevation (ft msl)	Top of Screen Depth (ft bgs)	Recorded Bottom of Well Screen Depth (ft bgs)	Water Table Elevation			Well Conditions						Well Coordinates	
				Depth to Water (ft bgs)	Water Table Elevation (ft msl)	Measured Total Depth (ft bgs)	Surface Completion	Protective Casing	Riser	Well Pad	Security	Sedimentation	X	Y
MW-26S	13.98	5	10	9.98	4.00	12.90	Stick up	Good	Good	Good	Locked	None	2668244.256	214930.035
MW-27	13.12	15	20	14.32	-1.20	20.00	Stick up	Good	Good	Good	Locked	None	2668403.411	214497.49
MW-28	5.1	15	20	14.12	-9.02	20.00	Flush	Good	Good	Good	Bolted	None	2670951.282	217010.408
MW-29	6.77	18	23	17.01	-10.24	22.54	Flush	Good	Good	Good	Bolted	None	2671864.029	217477.336
MW-30	6.21	18	23	16.46	-10.25	22.55	Flush	Good	Good	Good	Bolted	None	2671914.721	217241.724
MW-31	4.81	19	24	14.93	-10.12	24.00	Flush	Good	Good	Good	Bolted	None	2672266.542	215889.31
MW-32	4.81	18	23	15.22	-10.41	22.88	Flush	Good	Good	Good	Bolted	None	2672545.806	216611.672
MW-33	7.75	15	20	12.68	-4.93	16.36	Flush	Good	Good	Good	Bolted	None	2668957.043	214305.393
MW-34D	16.64	27	32	16.18	0.46	32.00	Stick up	Good	Good	Good	Locked	None	2669131.936	218366.373
MW-34S	16.49	7	12	6.73	9.76	12.00	Stick up	Good	Good	Good	Locked	None	2669134.409	218368.847
MW-35	2.41	14	19	9.85	-7.44	19.00	Flush	Good	Good	Good	Bolted	Minimal	2670210.283	214981.684
MW-36	9.21	9	14	11.66	-2.45	15.60	Stick up	Good	Good	Good	Locked	None	2668791.27	216621.98
MW-37	16.72	14	19	14.93	1.79	20.08	Stick up	Good	Good	Good	Locked	None	2668638.179	216281.203
MW-38	17.34	18.5	23.5	14.46	2.88	24.50	Stick up	Good	Good	Good	Locked	None	2668748.533	215905.281
MW-39	23.82	23.5	28.5	23.22	0.60	28.20	Stick up	Good	Good	Good	Locked	None	2668987.526	215284.234
MW-40	3.31	13	18	11.51	-8.20	18.00	Flush	Good	Good	Good	Bolted	None	2670809.301	215506.83
MW-41D	14.97	27	32	17.58	-2.61	31.00	Flush	Good	Good	Good	Bolted	None	2669417.49	217276.378
MW-41S	15.05	6.5	11.5	8.50	6.55	10.50	Flush	Good	Good	Good	Bolted	None	2669411.069	217271.48
MW-42	6.91	19	24	15.56	-8.65	23.00	Flush	Good	Good	Good	Bolted	None	2670664.747	217304.473
MW-43	4.25	15	20	13.35	-9.10	19.41	Flush	Good	Good	Good	Bolted	None	2671325.359	216587.611
MW-44	12.26	24	29	19.05	-6.79	29.00	Flush	Good	Good	Good	Bolted	None	2669954.454	214286.192
MW-45	16.69	14	19	17.35	-0.66	18.50	Flush	Good	Good	Good	Bolted	Some	2669299.512	216201.871
MW-46	2.76	15	20	10.60	-7.84	19.30	Flush	Good	Good	Good	Bolted	None	2670339.039	216221.325
MW-47	5.43	19	24	15.96	-10.53	23.44	Flush	Good	Good	Good	Bolted	None	2672649.258	216428.58

Table 3-3d
Groundwater Level Data and Well Inspection Summary
(April 2016)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Top of Casing Elevation (ft msl)	Top of Screen Depth (ft bgs)	Recorded Bottom of Well Screen Depth (ft bgs)	Water Table Elevation			Well Conditions						Well Coordinates	
				Depth to Water (ft bgs)	Water Table Elevation (ft msl)	Measured Total Depth (ft bgs)	Surface Completion	Protective Casing	Riser	Well Pad	Security	Sedimentation	X	Y
MW-01D	13.41	27.00	37.00	14.01	-0.60	41.82	Stick up	Rusty	Good	Good	Locked	None	2669105.701	217191.6112
MW-01S	13.67	5.00	15.00	5.23	8.44	19.92	Stick up	Rusty	Good	Good	Locked	None	2669123.113	217196.5786
MW-02	16.02	13.00	23.00	17.11	-1.09	25.74	Stick up	Good	Good	Good	Locked	Minimal	2668976.344	216695.5715
MW-03	5.44	9.75	19.75	9.96	-4.52	22.24	Stick up	Good	Good	Good	Locked	Minimal	2668353.965	216200.2587
MW-04	20.47	14.00	29.00	11.79	8.68	31.37	Stick up	Good	Good	Good	Locked	None	2668459.88	216459.822
MW-05D	20.25	25.00	35.00	19.43	0.82	38.04	Stick up	Good	Good	Not Visible	Locked	None	2667926.368	217215.257
MW-05S	20.29	7.00	17.00	15.79	4.50	19.29	Stick up	Good	Good	Not Visible	Locked	None	2667933.815	217228.474
MW-06	17.61	10.00	20.00	11.03	6.58	21.99	Stick up	Good	Good	Good	Locked	Minimal	2668278.817	217645.142
MW-07D	13.88	22.00	32.00	10.90	2.98	34.42	Stick up	Good	Good	Good	Locked	Minimal	2668574.143	218445.404
MW-07S	13.88	9.50	19.50	11.86	2.02	21.72	Stick up	Good	Good	Good	Locked	Minimal	2668547.793	218461.969
MW-08	13.01	3.53	13.53	Obstructed			Stick up	Good	Good	Good	Locked	Minimal	2669480.042	218882.853
MW-09	18.71	3.00	18.00	10.90	7.81	20.75	Stick up	Good	Good	Good	Locked	None	2669553.923	217959.7361
MW-10	89.43	60.00	80.00	Not included due to obstruction									2668838.457	217744.7621
MW-11	72.78	32.00	52.00	52.02	20.76	52.00	Stick up	Rusty	Good	Good	Locked	Minimal	2668552.334	217310.216
MW-13D	17.06	120	130	16.63	0.43	126.18	Stick up	Good	Good	Good	Locked	None	2668662.96	215647.80
MW-13I	16.97	60	70	16.42	0.55	70.12	Stick up	Good	Good	Good	Locked	Minimal	2668662.96	215647.80
MW-13S	17.26	20	30	16.51	0.75	30.54	Stick up	Good	Good	Good	Locked	None	2668672.43	215650.98
MW-14D	12.93	122.5	132.5	10.80	2.13	133.08	Stick up	Good	Good	Good	Locked	Some	2669511.50	218757.92
MW-14S	14	15	25	12.18	1.82	26.19	Stick up	Good	Good	Good	Locked	Some	2669515.35	218746.96
MW-15D	15.47	263	273	17.40	-1.93	277.00	Flush	Good	Good	Good	Bolted	None	2669703.47	217761.93
MW-15S	15.92	19	29	17.80	-1.88	28.14	Flush	Good	Good	Good	Bolted	Some	2669709.50	217760.75
MW-19	18.31	90	100	17.79	0.52	102.60	Stick up	Good	Good	Good	Locked	None	2668750.911	215899.146
MW-21D	17.86	80	90	18.30	-0.44	90.00	Stick up	Good	Good	Good	Locked	Minimal	2668389.615	214906.884
MW-21S	17.95	40	50	18.24	-0.29	50.00	Stick up	Good	Good	Good	Locked	None	2668389.615	214906.884
MW-24	13.29	15	20	8.31	4.98	22.40	Stick up	Good	Good	Good	Locked	None	2667802.624	215178.711
MW-25	16.01	20	25	10.92	5.09	24.46	Flush	Good	Good	Good	Bolted	None	2667938.419	215364.217
MW-26D	13.83	12	17	13.87	-0.04	17.00	Stick up	Good	Good	Good	Locked	None	2668242.169	214923.67
MW-26S	13.98	5	10	10.03	3.95	12.90	Stick up	Good	Good	Good	Locked	None	2668244.256	214930.035
MW-27	13.12	15	20	14.30	-1.18	20.00	Stick up	Good	Good	Good	Locked	None	2668403.411	214497.49
MW-33	7.75	15	20	12.27	-4.52	16.36	Flush	Good	Good	Good	Bolted	None	2668957.043	214305.393
MW-34D	16.64	27	32	16.40	0.24	32.00	Stick up	Good	Good	Good	Locked	None	2669131.936	218366.373
MW-34S	16.49	7	12	6.30	10.19	12.00	Stick up	Good	Good	Good	Locked	None	2669134.409	218368.847
MW-36	9.21	9	14	11.05	-1.84	15.60	Stick up	Good	Good	Good	Locked	None	2668791.27	216621.98
MW-37	16.72	14	19	14.20	2.52	20.08	Stick up	Good	Good	Good	Locked	None	2668638.179	216281.203
MW-38	17.34	18.5	23.5	16.53	0.81	24.50	Stick up	Good	Good	Good	Locked	None	2668748.533	215905.281
MW-39	23.82	23.5	28.5	23.36	0.46	28.20	Stick up	Good	Good	Good	Locked	None	2668987.526	215284.234
MW-41D	14.97	27	32	17.51	-2.54	31.00	Flush	Good	Good	Good	Bolted	None	2669417.49	217276.378
MW-41S	15.05	6.5	11.5	8.39	6.66	10.50	Flush	Good	Good	Good	Bolted	None	2669411.069	217271.48

Table 3-4a
Water Quality Parameters
(March 2014)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Average Water Quality within Screened Interval of Wells				
	Temperature (Celsius)	Conductivity (uS/cm)	DO (mg/L)	pH	ORP (mV)
MW-01D	12.99	1834	1.31	7.4900	-82.00
MW-01S	8.82	1291	1.19	7.3300	-119.00
MW-02	12.43	1625	1.18	7.2100	-102.00
MW-03	11.18	402	0.00	6.6800	-155.00
MW-04	15.04	32550	1.42	6.3400	-31.00
MW-05D	16.37	1260	1.26	6.0200	-47.00
MW-05S	17.00	9183	1.11	6.5200	-94.00
MW-06	17.95	1920	-0.35	6.3100	-125.00
MW-07D	14.53	2395	1.22	6.8500	-75.00
MW-07S	13.89	40170	1.43	6.5200	-108.00
MW-08	8.77	47860	1.44	7.1600	-111.00
MW-09	10.43	300	1.28	5.9900	-32.00
MW-10	Not included due to obstruction				
MW-11	21.16	3136	1.80	6.7200	-42.00
MW-12	11.36	9741	1.46	6.8600	27.00
MW-13D	17.29	11170	6.00	12.1200	77.00
MW-13I	12.99	733	1.32	7.3300	-136.00
MW-13S	12.00	698	1.27	7.5200	-97.00
MW-14D	15.12	684	4.10	10.6200	-113.00
MW-14S	9.84	52980	1.58	6.8200	-61.00
MW-15D	14.06	148	1.17	6.0500	24.00
MW-15S	14.05	1534	0.74	6.8700	-4.00
MW-16D	12.39	1538	0.53	7.2300	-69.00
MW-16S	13.70	3642	0.74	6.8700	-35.00
MW-17D	9.73	425	1.52	7.3200	-182.00
MW-17S	9.44	311	3.15	7.6500	49.00
MW-18D	12.26	1801	0.74	6.8000	-102.00
MW-18S	12.24	2403	1.00	4.9000	132.00
MW-19	12.67	1292	1.47	5.8800	39.00
MW-20D	15.22	7877	1.17	6.8400	-54.00
MW-20I	13.57	1099	1.42	6.5900	-240.00
MW-20S	12.50	1333	34.70	6.4700	-230.00
MW-21D	12.66	465	1.13	7.3200	33.00
MW-21S	12.64	437	1.22	7.7500	30.00
MW-22	10.37	231	3.94	8.0700	-33.00
MW-23D	6.24	2495	1.55	6.9400	21.00
MW-23I	8.32	1524	1.36	5.6900	29.00
MW-23S	9.37	1744	1.21	6.0100	-20.00

Table 3-4a
Water Quality Parameters
(March 2014)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Average Water Quality within Screened Interval of Wells				
	Temperature (Celsius)	Conductivity (uS/cm)	DO (mg/L)	pH	ORP (mV)
MW-24	12.14	1638	1.42	6.7500	-65.00
MW-25	15.33	2261	3.88	6.5900	-52.00
MW-26D	12.46	3934	1.31	6.1400	-39.00
MW-26S	9.37	5173	0.86	6.3300	-10.00
MW-27	11.48	7344	0.00	6.5200	-60.00
MW-28	14.20	1855	1.02	6.4800	-146.00
MW-29	13.82	975	4.71	7.0200	112.00
MW-30	14.41	1257	1.36	7.0200	-3.00
MW-31	11.95	705	1.36	7.8400	-62.00
MW-32	15.15	1343	1.23	7.0500	-44.00
MW-33	13.50	767	1.38	6.8600	47.00
MW-34D	12.62	4440	1.47	5.8600	-67.00
MW-34S	8.08	22031	1.53	6.5300	-69.00
MW-35	12.73	600	1.29	8.0500	-40.00
MW-36	5.82	1066	1.10	7.1700	-158.00
MW-37	11.72	4309	1.38	7.3000	-94.00
MW-38	11.00	7973	1.40	6.6800	41.00
MW-39	12.63	1132	3.48	7.0900	63.00
MW-40	13.98	511	3.33	7.6700	52.00
MW-41D	15.68	2968	1.37	7.4900	-58.00
MW-41S	11.07	1632	4.19	7.5500	-77.00
MW-42	14.76	5836	1.18	5.9200	14.00
MW-43	13.94	1283	1.23	6.0600	-89.00
MW-44	15.80	1021	1.25	6.7300	-16.00
MW-45	12.43	2128	1.53	6.2800	36.00
MW-46	11.95	1208	1.08	6.3700	-67.00
MW-47	15.54	1718	1.12	5.9600	26.00

Table 3-4b

Water Quality Parameters

(December 2014)

Clearview Landfill Groundwater, Operable Unit 3 (OU-3)

Philadelphia and Delaware Counties, Pennsylvania

Well Number	Average Water Quality within Screened Interval of Wells				
	Temperature (Celsius)	Conductivity (uS/cm)	DO (mg/L)	pH	ORP (mV)
MW-01D	13.89	1880	0.03	6.67	-59.00
MW-01S	12.57	657	0.18	7.34	-123.00
MW-02	11.95	1768	0.06	9.96	-140.00
MW-03	13.75	2099	0.40	6.69	-130.00
MW-04	14.11	1966	0.11	6.58	-72.20
MW-05D	17.20	3155	0.39	6.59	-96.50
MW-05S	17.43	2711	0.12	6.87	-96.50
MW-06	18.62	4826	0.42	6.82	-127.00
MW-07D	14.31	2527	0.12	7.10	-104.90
MW-07S	14.73	1901	0.08	6.70	-92.10
MW-08	12.95	1056	0.28	7.20	-98.60
MW-09	14.79	466	0.23	6.54	-99.30
MW-10	Not included due to obstruction				
MW-11	12.92	3124	2.01	6.88	62.00
MW-12	15.39	3150	0.14	6.82	-104.20
MW-13D	10.34	4111	3.00	12.25	-30.20
MW-13I	12.46	1014	0.38	11.71	66.80
MW-13S	13.15	1352	0.11	6.62	91.60
MW-14D	12.75	578	0.71	11.23	-141.50
MW-14S	13.99	1817	0.35	6.90	-99.20
MW-15D	15.67	168	0.10	6.56	-62.40
MW-15S	17.58	1663	0.07	6.95	-154.00
MW-16D	14.40	668	0.09	8.49	-208.70
MW-16S	16.39	2105	0.61	7.18	-104.40
MW-17D	12.14	351	0.35	5.50	115.50
MW-17S	13.94	365	0.43	5.61	166.90
MW-18D	12.90	222	0.60	7.16	-79.20
MW-18S	15.33	423	0.17	5.19	216.80
MW-19	12.30	613	0.50	5.76	34.80
MW-20D	16.07	856	0.18	7.00	86.70
MW-20I	14.30	623	0.39	7.41	-107.90
MW-20S	13.00	831	2.02	9.74	-38.70
MW-21D	14.50	471	0.08	5.60	52.20
MW-21S	14.34	477	0.12	5.60	63.60
MW-22	13.83	181	3.30	7.26	112.00
MW-23D	Not included due to obstruction				
MW-23I	12.81	415	0.13	6.24	24.10
MW-23S	12.57	416	0.30	6.30	39.90

Table 3-4b

Water Quality Parameters

(December 2014)

Clearview Landfill Groundwater, Operable Unit 3 (OU-3)

Philadelphia and Delaware Counties, Pennsylvania

Well Number	Average Water Quality within Screened Interval of Wells				
	Temperature (Celsius)	Conductivity (uS/cm)	DO (mg/L)	pH	ORP (mV)
MW-24	10.63	1310	4.25	6.38	-33.90
MW-25	11.73	1839	2.19	6.42	-44.30
MW-26D	14.79	963	0.18	6.33	-45.50
MW-26S	14.01	711	0.08	6.36	-68.10
MW-27	14.42	1216	0.32	6.77	-57.00
MW-28	17.07	2283	0.12	6.58	47.10
MW-29	17.98	832	1.50	5.94	213.40
MW-30	18.63	1066	0.13	6.31	165.20
MW-31	18.15	788	0.53	6.03	186.50
MW-32	17.26	1265	0.17	6.08	160.10
MW-33	17.85	727	0.23	6.18	158.40
MW-34D	14.02	999	0.53	6.26	-18.30
MW-34S	13.81	2656	0.26	6.61	-22.50
MW-35	17.44	673	0.21	6.48	94.10
MW-36	13.23	2350	0.47	7.23	-104.30
MW-37	13.36	4430	0.12	7.02	-110.60
MW-38	13.60	17950	0.13	6.84	7.70
MW-39	13.53	1364	2.68	6.02	186.00
MW-40	14.77	425	3.39	5.73	216.00
MW-41D	15.63	2525	0.21	6.34	27.40
MW-41S	8.95	1841	1.99	6.80	-79.40
MW-42	16.94	970	0.13	6.24	135.90
MW-43	16.71	866	0.54	6.38	72.10
MW-44	16.65	808	0.16	6.42	35.80
MW-45	Not included due to Dry Well				
MW-46	14.18	1100	1.31	6.40	270.00
MW-47	16.87	1	0.24	6.28	163.30

Table 3-4c
Water Quality Parameters
(July 2015)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Average Water Quality within Screened Interval of Wells				
	Temperature (Celsius)	Conductivity (uS/cm)	DO (mg/L)	pH	ORP (mV)
MW-01D	16.75	709	0.33	6.57	-58.20
MW-01S	19.74	630	0.10	6.87	-164.80
MW-02	12.35	1572	0.26	7.04	-126.90
MW-03	13.14	2600	0.16	6.65	-89.00
MW-04	17.78	1899	0.12	6.49	-45.10
MW-05D	18.36	1196	0.37	5.23	-19.60
MW-05S	17.75	2359	0.41	6.35	-43.30
MW-06	18.91	2558	0.55	6.76	-90.80
MW-07D	15.32	2067	0.35	6.83	-83.00
MW-07S	15.37	1764	0.40	6.50	-104.30
MW-08	14.96	928	0.33	7.10	-99.40
MW-09	17.18	458	0.49	4.97	-28.30
MW-10	Not included due to obstruction				
MW-11	74.86	3197	1.85	6.48	-126.70
MW-12	17.07	3005	0.24	6.76	-64.30
MW-13D	19.27	6480	0.96	12.65	-86.20
MW-13I	14.89	616	0.42	10.13	11.00
MW-13S	14.93	1048	0.15	6.61	113.20
MW-14D	16.83	430	2.80	10.64	44.80
MW-14S	14.36	1582	0.29	7.04	-109.60
MW-15D	20.50	166	0.34	6.44	-37.30
MW-15S	17.71	1399	0.30	6.76	-127.70
MW-16D	17.41	491	0.07	7.74	-219.70
MW-16S	15.91	1650	0.16	7.00	-124.80
MW-17D	14.42	337	0.28	3.19	309.60
MW-17S	14.08	290	1.74	4.05	355.40
MW-18D	15.39	208	0.13	5.65	42.10
MW-18S	15.18	327	0.24	2.83	425.50
MW-19	15.20	752	0.25	6.12	-25.70
MW-20D	19.84	633	0.74	6.94	-105.00
MW-20I	18.23	311	0.12	6.49	-50.80
MW-20S	21.50	760	2.63	8.25	-80.30
MW-21D	15.07	456	0.22	4.21	152.60
MW-21S	15.71	448	0.28	5.24	124.50
MW-22	15.57	191	0.15	6.25	-54.10
MW-23D	18.45	643	0.21	7.00	-142.70
MW-23I	14.70	438	0.11	5.99	29.40
MW-23S	16.10	440	0.04	5.99	34.00

Table 3-4c
Water Quality Parameters
(July 2015)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Average Water Quality within Screened Interval of Wells				
	Temperature (Celsius)	Conductivity (uS/cm)	DO (mg/L)	pH	ORP (mV)
MW-24	16.42	1541	0.11	6.34	-95.40
MW-25	18.18	1934	0.26	7.02	-120.80
MW-26D	16.08	906	0.18	6.08	-3.30
MW-26S	18.15	642	0.35	6.16	-20.20
MW-27	15.00	1194	0.17	6.45	-23.90
MW-28	15.72	2086	0.30	6.60	83.80
MW-29	18.34	907	0.53	4.94	265.30
MW-30	17.72	1049	0.43	5.87	181.30
MW-31	19.10	769	0.75	5.82	169.30
MW-32	17.60	1283	0.35	5.95	226.50
MW-33	21.34	775	0.14	6.08	170.00
MW-34D	17.54	764	1.28	6.09	-70.00
MW-34S	18.05	1306	0.29	6.53	-66.10
MW-35	17.01	823	-0.33	6.27	197.00
MW-36	16.35	2420	0.21	6.95	-92.20
MW-37	14.65	4202	0.72	6.78	-58.40
MW-38	12.95	1994	0.05	6.70	4.30
MW-39	13.82	888	2.89	6.01	216.40
MW-40	15.83	553	3.51	5.59	322.90
MW-41D	16.48	2911	0.08	6.56	128.10
MW-41S	21.52	1132	0.30	6.45	-139.30
MW-42	16.00	1244	0.61	5.34	268.20
MW-43	15.65	1110	0.23	6.34	105.40
MW-44	16.13	1285	0.24	6.48	-41.60
MW-45	18.28	1054	3.36	6.34	96.80
MW-46	13.29	1041	0.25	6.57	259.20
MW-47	17.54	1202	0.51	5.78	207.40

Table 3-4d
Water Quality Parameters
(April 2016)
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Average Water Quality within Screened Interval of Wells				
	Temperature (Celsius)	Conductivity (uS/cm)	DO (mg/L)	pH	ORP (mV)
MW-01D	15.18	777	0.78	6.61	-77.00
MW-01S	13.25	611	0.68	6.86	-138.40
MW-02	12.22	1522	0.10	6.73	-117.50
MW-03	12.36	2806	1.59	6.67	-139.50
MW-04	15.38	1171	0.10	6.87	-54.20
MW-05D	17.72	1598	0.10	6.27	-83.80
MW-05S	18.05	3283	0.11	6.72	-88.00
MW-06	18.58	2828	0.13	6.75	-86.70
MW-07D	14.45	2012	0.22	6.45	-41.80
MW-07S	14.35	1611	0.14	6.44	-71.70
MW-08	Not included due to obstruction				
MW-09	14.14	391	0.15	6.55	-76.10
MW-10	Not included due to obstruction				
MW-11	21.89	2415	1.00	7.16	-10.70
MW-13D	12.52	6285	1.70	12.82	34.60
MW-13I	12.13	624	0.18	11.10	44.20
MW-13S	11.77	524	0.47	5.68	123.80
MW-14D	13.24	454	0.77	11.22	-45.10
MW-14S	12.52	1582	1.12	6.72	-126.00
MW-15D	16.96	106	0.20	6.98	-8.40
MW-15S	16.30	1864	1.00	6.68	-166.00
MW-19	12.87	880	1.87	6.16	-22.50
MW-21D	15.55	496	0.75	5.62	26.40
MW-21S	15.20	495	0.83	5.48	43.30
MW-24	13.13	917	0.21	6.74	-109.30
MW-25	14.52	1243	0.16	7.37	-115.00
MW-26D	15.36	1033	0.97	6.13	-72.60
MW-26S	12.90	681	1.12	6.12	-73.40
MW-27	12.78	1087	0.15	6.61	-78.50
MW-33	15.75	913	0.86	5.84	95.80
MW-34D	15.12	589	0.12	6.51	-21.10
MW-34S	12.26	1535	1.47	6.26	-88.80
MW-36	9.72	1260	0.19	6.91	-57.60
MW-37	13.05	2589	0.19	7.03	-65.80
MW-38	12.31	1106	0.98	6.85	-18.80
MW-39	13.65	1257	3.04	6.07	112.10
MW-41D	16.83	1900	0.25	6.60	53.70
MW-41S	13.89	841	4.20	6.27	-58.60

Table 3-5
Monitoring Well Summary
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Top of Casing Elevation (ft msl)	Top of Screen Depth (ft bgs)	Recorded Bottom of Well Screen Depth (ft bgs)	Well Coordinates		Monitored Aquifer	Location
				X	Y		
MW-01D	13.41	27.00	37.00	2669105.701	217191.6112	Shallow	Inside Landfill Boundary
MW-01S	13.67	5.00	15.00	2669123.113	217196.5786	Shallow	Inside Landfill Boundary
MW-02	16.02	13.00	23.00	2668976.344	216695.5715	Shallow	Inside Landfill Boundary
MW-03	5.44	9.75	19.75	2668353.965	216200.2587	Shallow	Inside Landfill Boundary
MW-04	20.47	14.00	29.00	2668459.88	216459.822	Shallow	Inside Landfill Boundary
MW-05D	20.25	25.00	35.00	2667926.368	217215.257	Shallow	Inside Landfill Boundary
MW-05S	20.29	7.00	17.00	2667933.815	217228.474	Shallow	Inside Landfill Boundary
MW-06	17.61	10.00	20.00	2668278.817	217645.142	Shallow	Inside Landfill Boundary
MW-07D	13.88	22.00	32.00	2668574.143	218445.404	Shallow	Inside Landfill Boundary
MW-07S	13.88	9.50	19.50	2668547.793	218461.969	Shallow	Inside Landfill Boundary
MW-08	13.01	3.53	13.53	2669480.042	218882.853	Shallow	Outside Landfill Boundary
MW-09	18.71	3.00	18.00	2669553.923	217959.7361	Shallow	Inside Landfill Boundary
MW-10	89.43	60.00	80.00	2668838.457	217744.7621	Shallow	Inside Landfill Boundary
MW-11	72.78	32.00	52.00	2668552.334	217310.216	Shallow	Inside Landfill Boundary
MW-12	21.45	10.00	30.00	2668569.106	216841.054	Shallow	Inside Landfill Boundary
MW-13D	17.06	120	130	2668662.96	215647.80	Deep	Outside Landfill Boundary
MW-13I	16.97	60	70	2668662.96	215647.80	Deep	Outside Landfill Boundary
MW-13S	17.26	20	30	2668672.43	215650.98	Shallow	Outside Landfill Boundary
MW-14D	12.93	122.5	132.5	2669511.50	218757.92	Deep	Outside Landfill Boundary
MW-14S	14	15	25	2669515.35	218746.96	Shallow	Outside Landfill Boundary
MW-15D	15.47	263	273	2669703.47	217761.93	Deep	Outside Landfill Boundary
MW-15S	15.92	19	29	2669709.50	217760.75	Shallow	Outside Landfill Boundary
MW-16D	12.15	160	170	2669658.27	217109.39	Deep	Outside Landfill Boundary
MW-16S	12.27	20	30	2669652.73	217117.58	Shallow	Outside Landfill Boundary
MW-17D	22.33	95	105	2667467.50	216998.77	Deep	Outside Landfill Boundary

Table 3-5
Monitoring Well Summary
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Top of Casing Elevation (ft msl)	Top of Screen Depth (ft bgs)	Recorded Bottom of Well Screen Depth (ft bgs)	Well Coordinates		Monitored Aquifer	Location
				X	Y		
MW-17S	22.43	15	25	2667469.47	217004.59	Shallow	Outside Landfill Boundary
MW-18D	13.74	215	225	2668733.53	218882.00	Deep	Outside Landfill Boundary
MW-18S	13.89	15	25	2668743.15	218882.95	Shallow	Outside Landfill Boundary
MW-19	18.31	90	100	2668750.911	215899.146	Deep	Outside Landfill Boundary
MW-20D	32.94	237	247	2668110.7	216811.057	Deep	Inside Landfill Boundary
MW-20I	32.97	185	195	2668110.7	216811.057	Deep	Inside Landfill Boundary
MW-20S	33.04	130	140	2668115.534	216812.399	Deep	Inside Landfill Boundary
MW-21D	17.86	80	90	2668389.615	214906.884	Deep	Outside Landfill Boundary
MW-21S	17.95	40	50	2668389.615	214906.884	Deep	Outside Landfill Boundary
MW-22	10.01	90	100	2669532.925	215439.275	Deep	Outside Landfill Boundary
MW-23D	25.93	140	150	2666695.637	217119.891	Deep	Outside Landfill Boundary
MW-23I	25.85	85	95	2666695.637	217119.891	Deep	Outside Landfill Boundary
MW-23S	25.88	40	50	2666695.637	217119.891	Deep	Outside Landfill Boundary
MW-24	13.29	15	20	2667802.624	215178.711	Shallow	Outside Landfill Boundary
MW-25	16.01	20	25	2667938.419	215364.217	Shallow	Outside Landfill Boundary
MW-26D	13.83	12	17	2668242.169	214923.67	Shallow	Outside Landfill Boundary
MW-26S	13.98	5	10	2668244.256	214930.035	Shallow	Outside Landfill Boundary
MW-27	13.12	15	20	2668403.411	214497.49	Shallow	Outside Landfill Boundary
MW-28	5.1	15	20	2670951.282	217010.408	Shallow	Outside Landfill Boundary
MW-29	6.77	18	23	2671864.029	217477.336	Shallow	Outside Landfill Boundary
MW-30	6.21	18	23	2671914.721	217241.724	Shallow	Outside Landfill Boundary
MW-31	4.81	19	24	2672266.542	215889.31	Shallow	Outside Landfill Boundary
MW-32	4.81	18	23	2672545.806	216611.672	Shallow	Outside Landfill Boundary
MW-33	7.75	15	20	2668957.043	214305.393	Shallow	Outside Landfill Boundary
MW-34D	16.64	27	32	2669131.936	218366.373	Shallow	Inside Landfill Boundary

Table 3-5
Monitoring Well Summary
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Well Number	Top of Casing Elevation (ft msl)	Top of Screen Depth (ft bgs)	Recorded Bottom of Well Screen Depth (ft bgs)	Well Coordinates		Monitored Aquifer	Location
				X	Y		
MW-34S	16.49	7	12	2669134.409	218368.847	Shallow	Inside Landfill Boundary
MW-35	2.41	14	19	2670210.283	214981.684	Shallow	Outside Landfill Boundary
MW-36	9.21	9	14	2668791.27	216621.98	Shallow	Inside Landfill Boundary
MW-37	16.72	14	19	2668638.179	216281.203	Shallow	Inside Landfill Boundary
MW-38	17.34	18.5	23.5	2668748.533	215905.281	Shallow	Outside Landfill Boundary
MW-39	23.82	23.5	28.5	2668987.526	215284.234	Shallow	Outside Landfill Boundary
MW-40	3.31	13	18	2670809.301	215506.83	Shallow	Outside Landfill Boundary
MW-41D	14.97	27	32	2669417.49	217276.378	Shallow	Outside Landfill Boundary
MW-41S	15.05	6.5	11.5	2669411.069	217271.48	Shallow	Outside Landfill Boundary
MW-42	6.91	19	24	2670664.747	217304.473	Shallow	Outside Landfill Boundary
MW-43	4.25	15	20	2671325.359	216587.611	Shallow	Outside Landfill Boundary
MW-44	12.26	24	29	2669954.454	214286.192	Shallow	Outside Landfill Boundary
MW-45	16.69	14	19	2669299.512	216201.871	Shallow	Outside Landfill Boundary
MW-46	2.76	15	20	2670339.039	216221.325	Shallow	Outside Landfill Boundary
MW-47	5.43	19	24	2672649.258	216428.58	Shallow	Outside Landfill Boundary

Table 4-1a

Inorganics Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Fraction	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S		MW09		MW11	
										03/10/14		03/10/14		03/10/14		03/11/14		03/20/14		03/18/14		03/18/14		03/11/14		03/25/14		03/25/14		03/11/14		03/25/14	
										Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Aluminum	Dissolved	7429-90-5	UG/L	n	2000	-	2000	21.3 - 516	3									30.3				21.3											
Antimony	Dissolved	7440-36-0	UG/L	n	0.78	6	0.78	0 - 0	0																								
Arsenic	Dissolved	7440-38-2	UG/L	c	0.052	10	0.052	1.1 - 26.7	16	1.6		6.8		14		5.1				2.1		1.6				5.8		26.7		7.9		3.9	
Barium	Dissolved	7440-39-3	UG/L	n	380	2000	380	22.6 - 1870	21	708		162		91.7		456		1870		302		1130		346		295		260		22.6		1640	
Beryllium	Dissolved	7440-41-7	UG/L	n	2.5	4	2.5	0 - 0	0																								
Boron	Dissolved	7440-42-8	UG/L	n	400	-	400	24.1 - 3950	21	251		337		1290		2560		1650		244		3950		1660		3210	J	1650	J	47.4		3760	J
Cadmium	Dissolved	7440-43-9	UG/L	n	0.92	5	0.92	0 - 0	0																								
Calcium	Dissolved	7440-70-2	UG/L	-	-	-	-	8010 - 156000	21	63700		105000		78100		88900		150000	J	30700	J	125000	J	151000		27100		37300		41700		80500	
Chromium	Dissolved	7440-47-3	UG/L	c	0.035	100	0.035	1.4 - 30.2	21	4.7	J	3.1	J	4	J	5.1	J	30.2		4.3		8.5		6.3	J	5.3	J	4.8	J	1.4	J	8.7	J
Cobalt	Dissolved	7440-48-4	UG/L	n	0.6	-	0.6	0.4 - 15.9	19	15.9		5.2		5.8		3.1		1.2	J	3.2	J	3.9	J			12		11.3		2.6		13.2	
Copper	Dissolved	7440-50-8	UG/L	n	80	1300	80	2.4 - 22.1	19	13		2.4		9.2		7.4		5.9		4.7		5.3		5.4				4.8	J			5.7	J
Iron	Dissolved	7439-89-6	UG/L	n	1400	-	1400	1280 - 76200	20	34500		24600		19200		42900		24600		60400		22400		15900		11600	J	46400	J	36500		11400	J
Lead	Dissolved	7439-92-1	UG/L	L	-	15	15	0.38 - 12.6	16	12.6		10.4		3		1.5		1.8		0.94	J	2		3.8									
Magnesium	Dissolved	7439-95-4	UG/L	-	-	-	-	7640 - 124000	20	28300		46700		45600		117000		60800		16400		124000		57400		80700		55100		15600		78600	
Manganese	Dissolved	7439-96-5	UG/L	n	43	-	43	3 - 12200	21	2200	J	680	J	677	J	536	J	335		4040		156		447	J	378		901		3750	J	81.1	
Mercury	Dissolved	7439-97-6	UG/L	n	0.063	2	0.063	0 - 0	0																								
Nickel	Dissolved	7440-02-0	UG/L	n	39	-	39	3.5 - 24.4	21	19.1		4		5		6.5		24.4		4.5		7.2		8.5		15.7		9.8		4.2		8.9	
Potassium	Dissolved	7440-09-7	UG/L	-	-	-	-	3220 - 87300	21	14200		12900		31500		39300		26100		11800		58600		37600		71200		40800		3220		87300	
Selenium	Dissolved	7782-49-2	UG/L	n	10	50	10	0.77 - 6.4	3	6.4																							
Silver	Dissolved	7440-22-4	UG/L	n	9.4	-	9.4	0.076 - 0.076	1																	0.076	J						
Sodium	Dissolved	7440-23-5	UG/L	-	-	-	-	4390 - 456000	21	281000		46600		136000		134000		89200		67100		195000		129000		128000		134000		4390		347000	
Thallium	Dissolved	7440-28-0	UG/L	n	0.02	2	0.02	0 - 0	0																								
Vanadium	Dissolved	7440-62-2	UG/L	n	8.6	-	8.6	1.2 - 11.7	6	3.7	J	1.2	J	2.8	J													5.2					
Zinc	Dissolved	7440-66-6	UG/L	n	600	-	600	2.9 - 981	21	19	J	8.3	J	8.1	J	8.9	J	10.4	J	16.3	J	24.1	J	9.9	J	4.4		2.9		16.7	J	5.4	
Aluminum	Total	7429-90-5	UG/L	n	2000	-	2000	24.6 - 30500	12			71.7		48.3				25.9		24.6												30500	
Antimony	Total	7440-36-0	UG/L	n	0.78	6	0.78	27.8 - 27.8	1																							27.8	
Arsenic	Total	7440-38-2	UG/L	c	0.052	10	0.052	0.56 - 51.9	16	1.4	J	8.8	J	15.5	J	5.1				2.3		1.8				5.5		28.7		6.6		51.9	
Barium	Total	7440-39-3	UG/L	n	380	2000	380	24.2 - 3960	21	756	J	178	J	104	J	453		1530		333		1140		326		253		266		24.2		3960	
Beryllium	Total	7440-41-7	UG/L	n	2.5	4	2.5	0.83 - 1.4	3																							1.4	
Boron	Total	7440-42-8	UG/L	n	400	-	400	27.3 - 4080	21	272		350		1440		2490		1430		261		4080		1490		2950		1770		51.2		3640	
Cadmium	Total	7440-43-9	UG/L	n	0.92	5	0.92	0.099 - 21.9	3							0.099	J															21.9	
Calcium	Total	7440-70-2	UG/L	-	-	-	-	13200 - 164000	21	67100		110000		86700		89200	J	137000	J	33500	J	128000	J	143000	J	23600		37400		37600	J	133000	
Chromium	Total	7440-47-3	UG/L	c	0.035	100	0.035	1.6 - 399	20	5.8	J	1.6	J	4.2	J	6.5	J	5.1	J	5.6	J	9.9	J	5.4	J	3.9		5.3				399	
Cobalt	Total	7440-48-4	UG/L	n	0.6	-	0.6	0.71 - 50.2	21	17.3		6.1		6.5		6.5		0.78	J	1.6		4		7.5		10.2		11.5		3.3		50.2	
Copper	Total	7440-50-8	UG/L	n	80	1300	80	2.2 - 753	18	15.3		2.2		8.6		5.2		6.4				6.1		5				5.1		3.5		753	
Cyanide	Total	57-12-5	UG/L	n	0.15	200	0.15	3.9 - 367	8							12.3				19.6		16.7				3.9	J	4.3	J			367	
Iron	Total	7439-89-6	UG/L	n	1400	-	1400	489 - 157000	21	37200	J	26500	J	21600	J	44900	J	21200		61600		22600		15700	J	9210	J	46000	J	35100	J	157000	J
Lead	Total	7439-92-1	UG/L	L	-	15	15	0.51 - 4470	19	1	J	3.6	J	0.51	J	2.8		2.9	J	0.73	J	2.5	J	1.8						0.68	J	4470	
Magnesium	Total	7439-95-4	UG/L	-	-	-	-	752 - 129000	21	29900		47700		50300		127000		54500		17900		129000		60300		66500		52600		16400		84200	
Manganese	Total	7439-96-5	UG/L	n	43	-	43	28.1 - 12800	21	2370		709		750		535	J	293		4290		157		442	J	321		857		3650	J	1340	
Mercury	Total	7439-97-6	UG/L	n	0.063	2	0.063	8.2 - 8.2	1																							8.2	
Nickel	Total	7440-02-0	UG/L	n	39	-	39	1.8 - 464	21	21.8		2.8		6.2		6.4	J	6.6	J	3.7	J	5.5	J	4.8	J	14		9.7		1.8	J	464	
Potassium	Total	7440-09-7	UG/L	-	-	-	-	2940 - 91900	21	15000		13400		34700		39900		22800		12700		60200		35100		61100		40000		2940		78500	
Selenium	Total	7782-49-2	UG/L	n	10	50	10	0.32 - 6.1	7	6.1		0.34	J-			1.7	J							0.38	J								
Silver	Total	7440-22-4	UG/L	n	9.4	-	9.4	26.3 - 26.3	1																							26.3	
Sodium	Total	7440-23-5	UG/L	-	-	-	-	4670 - 2E+06	21	296000		47000		148000		143000		79400		72100		197000		127000		109000		130000		4670		288000	
Thallium	Total	7440-28-0	UG/L	n	0.02	2	0.02	0 - 0	0																								
Vanadium	Total	7440-62-2	UG/L	n	8.6	-	8.6	0.15 - 327	12	3.8	J	1.9	J	3.4	J	2.2	J							0.89	J			5.8	J	0.15	J	327	J
Zinc	Total	7440-66-6	UG/L	n	600	-	600	4.6 - 5660	20	12.8	J	6.1	J	11.5	J	19.3	J	9.4		6.8		17.8		8.4	J			6		5.8	J	5660	

Inorganics Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Fraction	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW12		MW20D		MW20D-DUP		MW20I		MW20S		MW34D		MW34S		MW36		MW37	
										03/19/14		03/26/14		03/26/14		03/05/14		03/05/14		03/14/14		03/14/14		03/19/14		03/19/14	
										Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Aluminum	Dissolved	7429-90-5	UG/L	n	2000	-	2000	21.3 - 516	3									516									
Antimony	Dissolved	7440-36-0	UG/L	n	0.78	6	0.78	0 - 0	0																		
Arsenic	Dissolved	7440-38-2	UG/L	c	0.052	10	0.052	1.1 - 26.7	16	1.1		1.6				2		5						2.9		21.9	
Barium	Dissolved	7440-39-3	UG/L	n	380	2000	380	22.6 - 1870	21	1230		96.2		109		51.5		72.4		271		606		118		262	
Beryllium	Dissolved	7440-41-7	UG/L	n	2.5	4	2.5	0 - 0	0																		
Boron	Dissolved	7440-42-8	UG/L	n	400	-	400	24.1 - 3950	21	3100		703	J	699	J	285		24.1		93		761		971		3300	
Cadmium	Dissolved	7440-43-9	UG/L	n	0.92	5	0.92	0 - 0	0																		
Calcium	Dissolved	7440-70-2	UG/L	-	-	-	-	8010 - 156000	21	70600	J	32800		35900		21200		8010		40000		156000		58500	J	76000	J
Chromium	Dissolved	7440-47-3	UG/L	c	0.035	100	0.035	1.4 - 30.2	21	9		3.3	J	5.3	J	2.7	J	2.5	J	2.2	J	4.4	J	5.6		10.7	
Cobalt	Dissolved	7440-48-4	UG/L	n	0.6	-	0.6	0.4 - 15.9	19	2.2	J	6.7		7.1		1.6		0.4	J	2.5				1.8	J	7.8	J
Copper	Dissolved	7440-50-8	UG/L	n	80	1300	80	2.4 - 22.1	19	8		2.7	J	2.9	J	3.1		3.8		3.6		2.7		7		22.1	
Iron	Dissolved	7439-89-6	UG/L	n	1400	-	1400	1280 - 76200	20	7540		3770	J	5650	J	1280				76200		27400		13200		22500	
Lead	Dissolved	7439-92-1	UG/L	L	-	15	15	0.38 - 12.6	16	0.98	J			4.9		0.63	J	0.91	J	1.3		1.5		0.38	J	0.61	J
Magnesium	Dissolved	7439-95-4	UG/L	-	-	-	-	7640 - 124000	20	74500		14800		15600		7640				21500		38100		34800		82600	
Manganese	Dissolved	7439-96-5	UG/L	n	43	-	43	3 - 12200	21	96		249		282		128	J	3	J	12200	J	414	J	275		127	
Mercury	Dissolved	7439-97-6	UG/L	n	0.063	2	0.063	0 - 0	0																		
Nickel	Dissolved	7440-02-0	UG/L	n	39	-	39	3.5 - 24.4	21	6		8.9		7.9		7.1		20		3.5		4.8		4.2		9.6	
Potassium	Dissolved	7440-09-7	UG/L	-	-	-	-	3220 - 87300	21	62900		24600		23600		45400		85300		6300		15700		30000		72300	
Selenium	Dissolved	7782-49-2	UG/L	n	10	50	10	0.77 - 6.4	3							0.77	J	2.4	J								
Silver	Dissolved	7440-22-4	UG/L	n	9.4	-	9.4	0.076 - 0.076	1																		
Sodium	Dissolved	7440-23-5	UG/L	-	-	-	-	4390 - 456000	21	251000		185000		179000		132000		130000		34500		33500		135000		456000	
Thallium	Dissolved	7440-28-0	UG/L	n	0.02	2	0.02	0 - 0	0																		
Vanadium	Dissolved	7440-62-2	UG/L	n	8.6	-	8.6	1.2 - 11.7	6									1.4	J							11.7	
Zinc	Dissolved	7440-66-6	UG/L	n	600	-	600	2.9 - 981	21	981	J	7.4		6.4		16.4	J	18.2	J	9.4	J	14.2	J	6.2	J	6.5	J
Aluminum	Total	7429-90-5	UG/L	n	2000	-	2000	24.6 - 30500	12			3980		4260		44.4		680		33.8	J			162		47.9	
Antimony	Total	7440-36-0	UG/L	n	0.78	6	0.78	27.8 - 27.8	1																		
Arsenic	Total	7440-38-2	UG/L	c	0.052	10	0.052	0.56 - 51.9	16			2.3		0.56	J	1.8	J	4.9	J					2.6		20.8	
Barium	Total	7440-39-3	UG/L	n	380	2000	380	24.2 - 3960	21	1240		145		168		51.1	J	104	J	272		643		118		249	
Beryllium	Total	7440-41-7	UG/L	n	2.5	4	2.5	0.83 - 1.4	3			0.83	J	1.2													
Boron	Total	7440-42-8	UG/L	n	400	-	400	27.3 - 4080	21	3310		643		620		258		27.3		87.5		762		995		2930	
Cadmium	Total	7440-43-9	UG/L	n	0.92	5	0.92	0.099 - 21.9	3			1.1															
Calcium	Total	7440-70-2	UG/L	-	-	-	-	13200 - 164000	21	71600	J	45600		51800		22600		13200		38100	J	164000	J	57400	J	72800	J
Chromium	Total	7440-47-3	UG/L	c	0.035	100	0.035	1.6 - 399	20	11.3	J	20.3		42.8		2.5	J	5.6	J	4.9	J	3.3	J	32.6	J	10.7	J
Cobalt	Total	7440-48-4	UG/L	n	0.6	-	0.6	0.71 - 50.2	21	2.3		9		10.4		1.9		0.71	J	3.6		7.5		2		7.4	
Copper	Total	7440-50-8	UG/L	n	80	1300	80	2.2 - 753	18	9.7		8.4		104		4.4		4.6		3.1				6.9		24	
Cyanide	Total	57-12-5	UG/L	n	0.15	200	0.15	3.9 - 367	8			21														7.7	J-
Iron	Total	7439-89-6	UG/L	n	1400	-	1400	489 - 157000	21	7610		8700	J	10100	J	2220	J	489	J	82300	J	30800	J	13600		21500	
Lead	Total	7439-92-1	UG/L	L	-	15	15	0.51 - 4470	19	0.94	J	11.2		14.2		1.8	J	1.5	J	2.2		2.6		1.1	J	0.57	J
Magnesium	Total	7439-95-4	UG/L	-	-	-	-	752 - 129000	21	77500		15200		17000		7150		752		23400		44100		34900		78300	
Manganese	Total	7439-96-5	UG/L	n	43	-	43	28.1 - 12800	21	98.2		328		357		188		28.1		12800	J	436	J	287		122	
Mercury	Total	7439-97-6	UG/L	n	0.063	2	0.063	8.2 - 8.2	1																		
Nickel	Total	7440-02-0	UG/L	n	39	-	39	1.8 - 464	21	5.1	J	18.9		36.6		9.5		20.8		5	J	5.7	J	15	J	8.5	J
Potassium	Total	7440-09-7	UG/L	-	-	-	-	2940 - 91900	21	65100		21200		22300		38100		91900		6000		16900		29700		66000	
Selenium	Total	7782-49-2	UG/L	n	10	50	10	0.32 - 6.1	7							0.32	J	0.85	J			0.69	J				
Silver	Total	7440-22-4	UG/L	n	9.4	-	9.4	26.3 - 26.3	1																		
Sodium	Total	7440-23-5	UG/L	-	-	-	-	4670 - 2E+06	21	265000		167000		2060000		99800		137000		38000		37900		135000		424000	
Thallium	Total	7440-28-0	UG/L	n	0.02	2	0.02	0 - 0	0																		
Vanadium	Total	7440-62-2	UG/L	n	8.6	-	8.6	0.15 - 327	12									1.1	J	0.51	J	1.2	J			11.8	
Zinc	Total	7440-66-6	UG/L	n	600	-	600	4.6 - 5660	20	1470		98.6		94.1		15.3	J	14.2	J	8.8	J	11.8	J	4.6		6	

Analyte	Fraction	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S		MW09	
												Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Aluminum	Total	7429-90-5	ug/L	n	2000	-	2000	29.3	-	24600	9			39.4		4230										29.3							
Antimony	Total	7440-36-0	ug/L	n	0.78	6	0.78	0.19	-	12.8	3					0.19	J	0.33	J														
Arsenic	Total	7440-38-2	ug/L	c	0.052	10	0.052	0.91	-	72.1	17	0.91		72.1		30.7		10		1.1						2.8		9.9		34.7		24.5	
Barium	Total	7440-39-3	ug/L	n	380	2000	380	70.9	-	2560	21	861		138		234		1060		2220		996	J	1420		750		373		272		87.3	
Beryllium	Total	7440-41-7	ug/L	n	2.5	4	2.5	0.49	-	8	4																						
Boron	Total	7440-42-8	ug/L	n	400	-	400	20.5	-	3920	18	353	J+	170	J+	1380	J+	3160	J+	1360		1700		3920		3680		3320		1530			
Cadmium	Total	7440-43-9	ug/L	n	0.92	5	0.92	0.024	-	8.4	3																						
Calcium	Total	7440-70-2	ug/L	-	-	-	-	20300	-	183000	21	68500		104000		135000		156000		172000		59800	J	157000		156000		35600		40400		35500	
Chromium	Total	7440-47-3	ug/L	-	0.035	100	0.035	0.51	-	183	19	6.1		1.3	J	15.9		10.3		5.7		15.7	J	9.6	J	24.9		2.3		3.2			
Cobalt	Total	7440-48-4	ug/L	n	0.6	-	0.6	1.4	-	53.3	10									1.4						11.3		8		6.5			
Copper	Total	7440-50-8	ug/L	n	80	1300	80	0.33	-	786	13									0.89	J	12.1	J	3.9	J	0.61	J	0.33	J				
Cyanide	Total	57-12-5	ug/L	n	0.15	200	0.15	1.6	-	227	10							12.4				227		24.8		30.4						5.2	J
Iron	Total	7439-89-6	ug/L	n	1400	-	1400	281	-	201000	21	53800		35000		48300		55100		31100		96100		26300		22900		12300		37200		32900	
Lead	Total	7439-92-1	ug/L	L	-	15	15	1.5	-	2330	7					2.7										1.5							
Magnesium	Total	7439-95-4	ug/L	-	-	-	-	4820	-	191000	20	29500		43800		72900		191000		80000		43200		162000		104000		96800		59200		15600	
Manganese	Total	7439-96-5	ug/L	n	43	-	43	4.3	-	12700	21	2980		2730		1740		969		494		5900		130		622		304		757		4170	
Mercury	Total	7439-97-6	ug/L	n	0.063	2	0.063	0.016	-	3.7	14	0.23		0.043	J	0.069	J	0.044	J	0.11	J-	0.06	J-	0.031	J-	0.084	J-					0.029	J-
Nickel	Total	7440-02-0	ug/L	n	39	-	39	0.64	-	152	21	18.8		1.6		8.7		5.6		6.9		8	J	1.2	J	10.4		14.9	J	7.2	J	0.64	J
Potassium	Total	7440-09-7	ug/L	-	-	-	-	3540	-	100000	19	16300		9840		51400		79200		30200		63200		77800		100000		87500		48800		3540	
Selenium	Total	7782-49-2	ug/L	n	10	50	10	0.47	-	4.4	9	0.5	J			1	J	0.55	J			4.4	J							0.87	J		
Silver	Total	7440-22-4	ug/L	n	9.4	-	9.4	0.011	-	10.2	2																						
Sodium	Total	7440-23-5	ug/L	-	-	-	-	5260	-	3E+06	21	296000		20100		240000		262000		113000		2820000		2500000		437000		160000		133000		5260	
Thallium	Total	7440-28-0	ug/L	n	0.02	2	0.02	2.9	-	2.9	1																						
Vanadium	Total	7440-62-2	ug/L	n	8.6	-	8.6	0.36	-	186	21	5.7		2.2	J	19		5.8		2.1	J	5.6	J	5	J	6		0.62	J-	5		0.36	J-
Zinc	Total	7440-66-6	ug/L	n	600	-	600	2.3	-	2720	13			5.6		9.1				4.6						5.5		4.1	J			2.3	
Aluminum	Dissolved	7429-90-5	ug/L	n	2000	-	2000	13	-	90.1	2																						
Antimony	Dissolved	7440-36-0	ug/L	n	0.78	6	0.78	3.6	-	3.6	1											3.6	J										
Arsenic	Dissolved	7440-38-2	ug/L	c	0.052	10	0.052	1.1	-	34.9	21	1.4		21.7		15.2		6.2		1.1		2.8	J	1.7	J	2.5		9.1		34.9		22.3	
Barium	Dissolved	7440-39-3	ug/L	n	380	2000	380	44.3	-	1800	19	1080		44.3		191		650		1800		1030		1420		620		335		253		80.3	
Beryllium	Dissolved	7440-41-7	ug/L	n	2.5	4	2.5	0	-	0	0																						
Cadmium	Dissolved	7440-43-9	ug/L	n	0.92	5	0.92	0	-	0	0																						
Calcium	Dissolved	7440-70-2	ug/L	-	-	-	-	2450	-	230000	21	95600		77700		230000		102000		182000		70600		162000		180000		34800		40600		31400	
Chromium	Dissolved	7440-47-3	ug/L	-	0.035	100	0.035	0.64	-	18.8	15	6.3				6.8		5.1		3.9		14.3				18.8		2.3		3.3		0.69	J
Cobalt	Dissolved	7440-48-4	ug/L	n	0.6	-	0.6	0.038	-	15.7	14	15.7	J			6.3	J	2.5	J	1.2	J					8.7	J	7.6		6.5			
Copper	Dissolved	7440-50-8	ug/L	n	80	1300	80	0.19	-	0.59	5									0.36	J-												
Iron	Dissolved	7439-89-6	ug/L	n	1400	-	1400	2470	-	102000	20	36600	J	12100	J	23600	J	44400	J	24100	J	102000		27500		18200	J	12500		38600		29400	J
Lead	Dissolved	7439-92-1	ug/L	L	-	15	15	0.22	-	1.2	2																						
Magnesium	Dissolved	7439-95-4	ug/L	-	-	-	-	5060	-	158000	20	41500		32000		114000		125000		63900		43600		158000		84100		96400		62300		14300	
Manganese	Dissolved	7439-96-5	ug/L	n	43	-	43	0.24	-	13600	21	4250		1810		2310		565		397		6170		134		496		292		723		3790	
Mercury	Dissolved	7439-97-6	ug/L	n	0.063	2	0.063	0.016	-	0.32	20	0.14	J	0.037	J	0.04	J	0.044	J	0.32		0.075	J	0.048	J-	0.25		0.027	J	0.036	J	0.086	J-
Nickel	Dissolved	7440-02-0	ug/L	n	39	-	39	0.73	-	25	17	25	J	1.2	J	8.5	J	3.9	J	5.5	J					8.2	J	15.1		7.7		0.73	J
Potassium	Dissolved	7440-09-7	ug/L	-	-	-	-	3390	-	87000	21	22400	J	7330	J	81500	J	50100	J	26500		59800		72600		87000		84100		50300		3390	
Selenium	Dissolved	7782-49-2	ug/L	n	10	50	10	0.42	-	0.94	6	0.55	J			0.94	J	0.48	J											0.48	J		
Silver	Dissolved	7440-22-4	ug/L	n	9.4	-	9.4	0	-	0	0																						
Sodium	Dissolved	7440-23-5	ug/L	-	-	-	-	4570	-	540000	21	430000		15400		411000		170000		91800		439000		255000		540000		156000		129000		4570	
Thallium	Dissolved	7440-28-0	ug/L	n	0.02	2	0.02	0	-	0	0																						
Vanadium	Dissolved	7440-62-2	ug/L	n	8.6	-	8.6	0.27	-	12.5	19	4.9				3		4.4		1.8	J	5.7	J	4.9	J	4.7		0.56	J-	4.8		0.68	J
Zinc	Dissolved	7440-66-6	ug/L	n	600	-	600	2	-	5.3	11	5.3	J	2.2	J	2.2	J									2						3	

Table 4-1b

Inorganics Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Fraction	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW11		MW12		MW20D		MW20D-DUP		MW20I		MW20S		MW34D		MW34S		MW36		MW37	
												Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Aluminum	Total	7429-90-5	ug/L	n	2000	-	2000	29.3	-	24600	9	11500				24600		22700	J	4010		166								1130	
Antimony	Total	7440-36-0	ug/L	n	0.78	6	0.78	0.19	-	12.8	3	12.8																			
Arsenic	Total	7440-38-2	ug/L	c	0.052	10	0.052	0.91	-	72.1	17	30.2		1.5				6.5				5.5		1.6		1.1		12.8		15.8	
Barium	Total	7440-39-3	ug/L	n	380	2000	380	70.9	-	2560	21	2560		1940		362	J	350	J	70.9	J	131		331		1010		216		754	
Beryllium	Total	7440-41-7	ug/L	n	2.5	4	2.5	0.49	-	8	4	0.56				5.5		8		0.49	J										
Boron	Total	7440-42-8	ug/L	n	400	-	400	20.5	-	3920	18	3630		3860		353		370				20.5	J-			1420		2100		3380	
Cadmium	Total	7440-43-9	ug/L	n	0.92	5	0.92	0.024	-	8.4	3	8.4		0.024	J							0.038	J								
Calcium	Total	7440-70-2	ug/L	-	-	-	-	20300	-	183000	21	83400		105000		112000		135000	J	31000		20300		43500		183000		85400		124000	
Chromium	Total	7440-47-3	ug/L	-	0.035	100	0.035	0.51	-	183	19	183		13.9		14.7	J	23.3		4.2	J	0.51	J			5.8		9.5		20.3	
Cobalt	Total	7440-48-4	ug/L	n	0.6	-	0.6	1.4	-	53.3	10	53.3		3.9				4.2	J							2.5		3.4		10.1	
Copper	Total	7440-50-8	ug/L	n	80	1300	80	0.33	-	786	13	786		0.7	J	15.2	J	6.1	J	3.7	J	2.5	J			0.93	J			1.7	J
Cyanide	Total	57-12-5	ug/L	n	0.15	200	0.15	1.6	-	227	10	176		2.6	J-	10.8								1.6	J-	3.6	J				
Iron	Total	7439-89-6	ug/L	n	1400	-	1400	281	-	201000	21	201000		9140		17300		12300	J	4980		281		85600		32000		14600		26400	
Lead	Total	7439-92-1	ug/L	L	-	15	15	1.5	-	2330	7	2330				57.8		61				1.5								4.8	
Magnesium	Total	7439-95-4	ug/L	-	-	-	-	4820	-	191000	20	76300		110000		22100	J	29900		4820	J			25500		57300		49000		101000	
Manganese	Total	7439-96-5	ug/L	n	43	-	43	4.3	-	12700	21	660		191		745		1300		244		4.3		12700		496		373		305	
Mercury	Total	7439-97-6	ug/L	n	0.063	2	0.063	0.016	-	3.7	14	3.7				0.099	J			0.018	J-			0.055	J-	0.016	J-				
Nickel	Total	7440-02-0	ug/L	n	39	-	39	0.64	-	152	21	152		4		14.7	J	10	J	24.8	J	14.2		0.93	J	3.9		7.8	J	9.3	J
Potassium	Total	7440-09-7	ug/L	-	-	-	-	3540	-	100000	19	62400		76400				21400				61900		6870		33500		53200		93800	
Selenium	Total	7782-49-2	ug/L	n	10	50	10	0.47	-	4.4	9	0.77						2.3	J			0.59	J							0.47	J
Silver	Total	7440-22-4	ug/L	n	9.4	-	9.4	0.011	-	10.2	2	10.2										0.011	J								
Sodium	Total	7440-23-5	ug/L	-	-	-	-	5260	-	3E+06	21	346000		348000		2400000		108000	J	2240000		113000		40400		108000		256000		533000	
Thallium	Total	7440-28-0	ug/L	n	0.02	2	0.02	2.9	-	2.9	1					2.9	J														
Vanadium	Total	7440-62-2	ug/L	n	8.6	-	8.6	0.36	-	186	21	186		3.5		13.6	J	25.3		3.1	J	2.9		0.87	J	1.8	J	8.4		17.2	
Zinc	Total	7440-66-6	ug/L	n	600	-	600	2.3	-	2720	13	2720	J	2.9		109		49.3	J			56	J			6.9				11.7	J
Aluminum	Dissolved	7429-90-5	ug/L	n	2000	-	2000	13	-	90.1	2	13	J									90.1									
Antimony	Dissolved	7440-36-0	ug/L	n	0.78	6	0.78	3.6	-	3.6	1																				
Arsenic	Dissolved	7440-38-2	ug/L	c	0.052	10	0.052	1.1	-	34.9	21	5.7		1.3		1.3	J	1.5		2.1	J	5.3		1.6		1.1		12.6		13.6	
Barium	Dissolved	7440-39-3	ug/L	n	380	2000	380	44.3	-	1800	19	1780		1670				75				45.1		293		840		190		645	
Beryllium	Dissolved	7440-41-7	ug/L	n	2.5	4	2.5	0	-	0	0																				
Cadmium	Dissolved	7440-43-9	ug/L	n	0.92	5	0.92	0	-	0	0																				
Calcium	Dissolved	7440-70-2	ug/L	-	-	-	-	2450	-	230000	21	85500		84800		36400		33500		27600		2450		38000		190000		82200		112000	
Chromium	Dissolved	7440-47-3	ug/L	-	0.035	100	0.035	0.64	-	18.8	15	8.2		10.6										0.64	J	4.2		8.9		16.4	
Cobalt	Dissolved	7440-48-4	ug/L	n	0.6	-	0.6	0.038	-	15.7	14	2.5		3.1	J			1.2				0.038	J			2.2	J	3.1		8.6	
Copper	Dissolved	7440-50-8	ug/L	n	80	1300	80	0.19	-	0.59	5	0.27	J-													0.59	J-	0.19	J	0.41	J
Iron	Dissolved	7439-89-6	ug/L	n	1400	-	1400	2470	-	102000	20	9440	J	7430	J	3700		2470		3130				76200	J	27200	J	14800		25200	
Lead	Dissolved	7439-92-1	ug/L	L	-	15	15	0.22	-	1.2	2	1.2										0.22	J								
Magnesium	Dissolved	7439-95-4	ug/L	-	-	-	-	5060	-	158000	20	81800		91500		10100		10600		5060				22700		49200		48000		92200	
Manganese	Dissolved	7439-96-5	ug/L	n	43	-	43	0.24	-	13600	21	85.3		156		232		219		272		0.24	J	13600		404		349		260	
Mercury	Dissolved	7439-97-6	ug/L	n	0.063	2	0.063	0.016	-	0.32	20	0.018	J-	0.056	J-	0.019	J-	0.016	J	0.017	J-			0.18	J	0.038	J-	0.039	J	0.047	J
Nickel	Dissolved	7440-02-0	ug/L	n	39	-	39	0.73	-	25	17	12.8		3.2	J			2.7				13		0.91	J	3.2	J	4.5		7.9	
Potassium	Dissolved	7440-09-7	ug/L	-	-	-	-	3390	-	87000	21	76000		68500		16100		15300		8510		63800		6530		30300		50600		84900	
Selenium	Dissolved	7782-49-2	ug/L	n	10	50	10	0.42	-	0.94	6											0.53	J							0.42	J
Silver	Dissolved	7440-22-4	ug/L	n	9.4	-	9.4	0	-	0	0																				
Sodium	Dissolved	7440-23-5	ug/L	-	-	-	-	4570	-	540000	21	355000		441000		117000		111000		35200		114000		34800		94400		250000		508000	
Thallium	Dissolved	7440-28-0	ug/L	n	0.02	2	0.02	0	-	0	0																				
Vanadium	Dissolved	7440-62-2	ug/L	n	8.6	-	8.6	0.27	-	12.5	19	4.6		3		0.49	J	0.27	J-			2.6	J	1.1	J	1.5	J	7.7		12.5	
Zinc	Dissolved	7440-66-6	ug/L	n	600	-	600	2	-	5.3	11	4.6	J					3.1				3.1	J	2.9		5.3				3.4	

Table 4-1c

Inorganics Detected in Landfill Area Groundwater (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Fraction	CAS	KEY	RSL	MCL	Screening Value	Units	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S		MW09		MW11		MW12		MW20D		MW20I		MW20S	
												Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Aluminum	Total	7429-90-5	n	2000	-	2000	UG/L	2.8	-	7510	15	4.2	J	1040		47.7		NA		45						23.1		2.8	J	7.5	J	NA		7510				348	J	146	J	355	J
Antimony	Total	7440-36-0	n	0.78	6	0.78	UG/L	0.14	-	11.3	7							NA		0.67	J							0.14	J	0.14	J	NA		11.3								2	J
Arsenic	Total	7440-38-2	c	0.052	10	0.052	UG/L	0.45	-	43.4	18	0.45		43.4		16.6		NA		0.63		3.4		1.2		1.5		8.9		32.7		NA		15		1.2		2.2	J	2.4	J	6.2	J
Barium	Total	7440-39-3	n	380	2000	380	UG/L	48.7	-	2420	18	587		104		114		NA		1840		593	J	1250	J	530	J	353		307		NA		2420		1700	J	93.8	J	48.7	J	267	J
Beryllium	Total	7440-41-7	n	2.5	4	2.5	UG/L	0.036	-	0.28	6	0.22	J	0.053	J			NA				0.036	J									NA		0.28	J								
Cadmium	Total	7440-43-9	n	0.92	5	0.92	UG/L	0.014	-	4.6	7			0.026	J			NA		0.033	J											NA		4.6		0.014	J					0.18	J
Calcium	Total	7440-70-2	-	-	-	-	UG/L	23200	-	175000	18	67700		73100		96000		NA		168000		42300	J	142000	J	175000	J	40600		47800		NA		119000		94100	J	40900	J	23200	J	51800	J
Chromium	Total	7440-47-3	c	0.035	100	0.035	UG/L	1.7	-	85.9	16	3.2		3		3.3		NA		3.9		4.7		6		11.7		1.7	J	3		NA		85.9		8.6		4.8	J				
Cobalt	Total	7440-48-4	n	0.6	-	0.6	UG/L	0.73	-	15	16	9.2		0.73	J	2.6		NA		0.95	J	6.9		3.8		6		8.7		7.2		NA		15		3.1		1.1	J				
Copper	Total	7440-50-8	n	80	1300	80	UG/L	0.39	-	159	7	0.39	J-	2.3				NA		1.6	J							0.41	J			NA		159								5.4	
Cyanide	Total	57-12-5	n	0.15	200	0.15	UG/L	2.5	-	200	13			5.6	J-	2.5	J-	NA				62		34.2		21.6		18.3	J	11.6	J	NA		200	J			10.8	J	11.1	J	11.2	J
Iron	Total	7439-89-6	n	1400	-	1400	UG/L	1050	-	92800	18	32200		20600		28800		NA		29000	J	78300	J	24700	J	18800	J	13700	J	45300	J	NA		42500	J	9790	J	6360	J	3090	J	1050	J
Lead	Total	7439-92-1	L	-	15	15	UG/L	0.033	-	1130	13	0.084	J	9.3		0.055	J	NA		4.4								0.068	J	0.033	J	NA		1130				0.76	J	0.46	J	21.5	
Magnesium	Total	7439-95-4	-	-	-	-	UG/L	736	-	151000	18	24800		31500		53000		NA		71900		24100	J	151000	J	85700	J	101000		62700		NA		102000		102000	J	9390	J	4260	J	736	J
Manganese	Total	7439-96-5	n	43	-	43	UG/L	19.8	-	13000	18	1750		887		814		NA		380		5450		156		484		407		851		NA		355		115		244	J	231	J	19.8	J
Mercury	Total	7439-97-6	n	0.063	2	0.063	UG/L	0.014	-	0.065	12	0.054	J	0.065	J	0.039	J	NA		0.034	J	0.046	J	0.058	J	0.025	J	0.021	J+	0.018	J+	NA		0.045	J+	0.014	J						
Nickel	Total	7440-02-0	n	39	-	39	UG/L	1	-	135	18	12.4		1.4		2.5		NA		4.8		4	J	2.2	J	5.2	J	14.9		7.3		NA		135		3	J	3.6	J	4.8	J	14	J
Potassium	Total	7440-09-7	-	-	-	-	UG/L	5400	-	117000	18	13100		12500	J	37200		NA		27900		22300	J	63300	J	71800	J	85500		47300		NA		117000		75700	J	13300		5400		57200	
Selenium	Total	7782-49-2	n	10	50	10	UG/L	0.22	-	1.1	8	0.72	J	0.41	J	1.1	J	NA		0.22	J									0.76	J	NA		0.83	J								
Silver	Total	7440-22-4	n	9.4	-	9.4	UG/L	0.019	-	5.4	5							NA		0.019	J											NA		5.4				0.052	J			0.092	J
Sodium	Total	7440-23-5	-	-	-	-	UG/L	24800	-	7190000	18	217000		26300		138000		NA		102000		174000	J	216000	J	337000	J	142000		142000		NA		483000		7190000	J	85000		24800		105000	J-
Thallium	Total	7440-28-0	n	0.02	2	0.02	UG/L	0	-	0	0							NA														NA											
Vanadium	Total	7440-62-2	n	8.6	-	8.6	UG/L	0.73	-	79	14			3		2.9		NA		1.9	J	2.4	J	4.8		3.2		0.73	J	5.1		NA		79		2.3	J						
Zinc	Total	7440-66-6	n	600	-	600	UG/L	1.1	-	1440	17	2.9		8.4		1.1	J	NA		7.7				9.9		5.2		1.4	J	1.9	J	NA		1440		7.6		5.8	J+	9.7	J+	39.6	J+
Aluminum	Dissolved	7429-90-5	n	2000	-	2000	UG/L	0.97	-	41.8	20	3.9	J	2.9	J	5.7	J	11		9.3	J	9.4		8.2		18.5		4.2	J	11.2	J	3.9		18.6	J	3.2		0.97	J	3.7	J	41.8	
Antimony	Dissolved	7440-36-0	n	0.78	6	0.78	UG/L	0.11	-	2	10					0.11	J	0.21				2		0.15		0.16						2				0.18						0.82	J
Arsenic	Dissolved	7440-38-2	c	0.052	10	0.052	UG/L	0.44	-	40.9	20	0.44		40.9		16.1		4.9		0.59		3.8		1.2		1.5		8.6		32.8		24.2		4.5		1.2		1.9		2.2		5.2	
Barium	Dissolved	7440-39-3	n	380	2000	380	UG/L	43.9	-	2080	20	629		92.9		116		602		1820		602		1290		516		350		310		147		2080		1660		90.3		43.9		58.4	
Beryllium	Dissolved	7440-41-7	n	2.5	4	2.5	UG/L	0.032	-	1	10	0.19	J					1				0.032		1		1						1				1				0.053	J		
Cadmium	Dissolved	7440-43-9	n	0.92	5	0.92	UG/L	0	-	0	0																																
Calcium	Dissolved	7440-70-2	-	-	-	-	UG/L	10900	-	168000	20	69200		71000		94900		111000		168000		42300		146000		168000		38800		44900		37200		101000		91300		41800		21800		10900	
Chromium	Dissolved	7440-47-3	c	0.035	100	0.035	UG/L	0.25	-	15.7	20	3.4		0.84	J	3.2		4.6		3.6		5.1		5.6		11.1		1.7	J	3		0.92		10.5		8.5		1	J	0.39	J	0.25	J
Cobalt	Dissolved	7440-48-4	n	0.6	-	0.6	UG/L	0.051	-	9.7	20	9.7		0.24	J	2.5		2.3		0.92	J	8		3.4		5.8		8.6		7		0.23		3.3		3.1		0.83	J	0.28	J	0.051	J
Copper	Dissolved	7440-50-8	n	80	1300	80	UG/L	0.072	-	2.3	9							0.39				2		2		0.19						0.42		2.3		0.48							
Iron	Dissolved	7439-89-6	n	1400	-	1400	UG/L	16.5	-	85000	20	32700		17900		28300		50600		29800		77800		24100		18300		13800		46100		43400		12600		9930		5760		2840		16.5	J
Lead	Dissolved	7439-92-1	L	-	15	15	UG/L	0.02	-	0.46	19	0.02	J			0.023	J	0.043		0.036	J	0.023		0.042		0.037		0.061	J	0.18	J	0.031		0.46	J	0.025		0.043	J	0.037	J	0.13	J
Magnesium	Dissolved	7439-95-4	-	-	-	-	UG/L	501	-	154000	20	25700		31600		53100		136000		71700		23700		154000		86800		92800		61800		13300		97100		98600		9220		4340		501	
Manganese	Dissolved	7439-96-5	n	43	-	43	UG/L	3	-	12900	20	1870		825		816		521		389		4670		150		484		397		848		2220		88.3		112		240		215		3	
Mercury	Dissolved	7439-97-6	n	0.063	2	0.063	UG/L	0.014	-	0.06	16			0.015	J			0.037				0.027		0.03		0.026		0.032	J+	0.042	J+	0.025		0.017	J+	0.025		0.033	J			0.028	J
Nickel	Dissolved	7440-02-0	n	39	-	39	UG/L	0.39	-	14.5	20	13.1		0.46	J	2.5		2.8		4.4		4.7		2.2		5		14.5		7.3		0.39		7.1		3.1		2.2		3.9		8.4	
Potassium	Dissolved	7440-09-7	-	-	-	-	UG/L	3970	-	115000	20	14100		9400		36500		53600		28000		22200		64900		71800		80300		48600		3970		115000		73500		11400		5650		61500	
Selenium	Dissolved	7782-49-2	n	10	50	10	UG/L	5	-	5	8							5				5		5		5						5				5							
Silver	Dissolved	7440-22-4	n	9.4	-	9.4	UG/L	1	-	1	8							1				1		1		1						1				1							
Sodium	Dissolved	7440-23-5	-	-	-	-	UG/L	5270	-	494000	20	240000		25200		139000		181000		102000		172000		221000		338000		134000		141000		5270		441000		371000		85200	J	25600	J	116000	J
Thallium	Dissolved	7440-28-0	n	0.02	2	0.02	UG/L	0	-	0	0																																
Vanadium	Dissolved	7440-62-2	n	8.6	-	8.6	UG/L	0.65	-	8.4	17	2.5	J	0.65	J-	2.6	J	2.7		1.7	J	2.6		3.9		3		0.7	J	5		2.6		3.4		2.6							
Zinc	Dissolved	7440-66-6	n	600	-	600	UG/L	0.87	-	8.7	20	1.9	J	0.87	J	1.4	J	1.7		2.3	J	1.6		6.6		2		6.5	J	7.6	J	5.7		8.7	J	3.6		2.8	J	7.3	J	5.5	J

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-1c

Inorganics Detected in Landfill Area Groundwater (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Fraction	CAS	KEY	RSL	MCL	Screening Value	Units	MW34D		MW34S		MW36		MW37	
								Result		Result		Result		Result	
Aluminum	Total	7429-90-5	n	2000	-	2000	UG/L	519		27.3		21.6		2090	
Antimony	Total	7440-36-0	n	0.78	6	0.78	UG/L					0.2	J	0.36	J
Arsenic	Total	7440-38-2	c	0.052	10	0.052	UG/L	2.1		0.68		13		4	
Barium	Total	7440-39-3	n	380	2000	380	UG/L	319	J	729	J	295		681	
Beryllium	Total	7440-41-7	n	2.5	4	2.5	UG/L	0.048	J					0.087	J
Cadmium	Total	7440-43-9	n	0.92	5	0.92	UG/L			0.016	J			0.035	J
Calcium	Total	7440-70-2	-	-	-	-	UG/L	44800	J	167000	J	166000		123000	
Chromium	Total	7440-47-3	c	0.035	100	0.035	UG/L	2.6		2.8		9.2		17.3	
Cobalt	Total	7440-48-4	n	0.6	-	0.6	UG/L	1.7		1.2		3.5		7.8	
Copper	Total	7440-50-8	n	80	1300	80	UG/L							3.9	
Cyanide	Total	57-12-5	n	0.15	200	0.15	UG/L					22.9	J	11.5	J
Iron	Total	7439-89-6	n	1400	-	1400	UG/L	92800	J	27900	J	33900	J	17300	J
Lead	Total	7439-92-1	L	-	15	15	UG/L			1.8		0.33	J	7.6	
Magnesium	Total	7439-95-4	-	-	-	-	UG/L	24100	J	40200	J	93000		96500	
Manganese	Total	7439-96-5	n	43	-	43	UG/L	13000		402		578		294	
Mercury	Total	7439-97-6	n	0.063	2	0.063	UG/L							0.014	J+
Nickel	Total	7440-02-0	n	39	-	39	UG/L	1	J	1.1	J	4.3		8.3	
Potassium	Total	7440-09-7	-	-	-	-	UG/L	6910	J	20000	J	106000		94500	
Selenium	Total	7782-49-2	n	10	50	10	UG/L					0.42	J	0.61	J
Silver	Total	7440-22-4	n	9.4	-	9.4	UG/L							0.12	J
Sodium	Total	7440-23-5	-	-	-	-	UG/L	41200	J	52500	J	501000		531000	
Thallium	Total	7440-28-0	n	0.02	2	0.02	UG/L								
Vanadium	Total	7440-62-2	n	8.6	-	8.6	UG/L	2.4	J	1.2	J	7.8		10.3	
Zinc	Total	7440-66-6	n	600	-	600	UG/L	4.3		6.4		3.9		45.1	
Aluminum	Dissolved	7429-90-5	n	2000	-	2000	UG/L	2.6		8.3		13.3	J	18	J
Antimony	Dissolved	7440-36-0	n	0.78	6	0.78	UG/L	2		2					
Arsenic	Dissolved	7440-38-2	c	0.052	10	0.052	UG/L	1.3		0.5		12.6		4.6	
Barium	Dissolved	7440-39-3	n	380	2000	380	UG/L	308		727		286		766	
Beryllium	Dissolved	7440-41-7	n	2.5	4	2.5	UG/L	1		1					
Cadmium	Dissolved	7440-43-9	n	0.92	5	0.92	UG/L								
Calcium	Dissolved	7440-70-2	-	-	-	-	UG/L	42000		167000		87400		125000	
Chromium	Dissolved	7440-47-3	c	0.035	100	0.035	UG/L	0.59		2.7		8.8		15.7	
Cobalt	Dissolved	7440-48-4	n	0.6	-	0.6	UG/L	1		1.2		3.4		6.9	
Copper	Dissolved	7440-50-8	n	80	1300	80	UG/L	0.072		0.13					
Iron	Dissolved	7439-89-6	n	1400	-	1400	UG/L	85000		26000		17600		27700	
Lead	Dissolved	7439-92-1	L	-	15	15	UG/L	0.028		0.047		0.075	J	0.15	J
Magnesium	Dissolved	7439-95-4	-	-	-	-	UG/L	22600		38400		44500		97600	
Manganese	Dissolved	7439-96-5	n	43	-	43	UG/L	12900		380		306		287	
Mercury	Dissolved	7439-97-6	n	0.063	2	0.063	UG/L	0.027		0.026		0.06	J+	0.014	J+
Nickel	Dissolved	7440-02-0	n	39	-	39	UG/L	0.67		1.1		4.2		6.4	
Potassium	Dissolved	7440-09-7	-	-	-	-	UG/L	6610		19000		56300		96100	
Selenium	Dissolved	7782-49-2	n	10	50	10	UG/L	5		5					
Silver	Dissolved	7440-22-4	n	9.4	-	9.4	UG/L	1		1					
Sodium	Dissolved	7440-23-5	-	-	-	-	UG/L	38800		49200		244000		494000	
Thallium	Dissolved	7440-28-0	n	0.02	2	0.02	UG/L								
Vanadium	Dissolved	7440-62-2	n	8.6	-	8.6	UG/L	2.6		0.91		7.4		8.4	
Zinc	Dissolved	7440-66-6	n	600	-	600	UG/L	1.3		1.8		6.5	J	6.2	J

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-2a

Volatile Organic Compounds (VOCs) Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S		MW09		MW11		MW12		MW20D		MW20D-DUP	
											03/10/14		03/10/14		03/10/14		03/11/14		03/20/14		03/18/14		03/18/14		03/11/14		03/25/14		03/25/14		03/11/14		03/25/14		03/19/14		03/26/14		03/26/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1,1-Trichloroethane	71-55-6	UG/L	n	800	200	200	0	-	0	0																														
1,1,2,2-Tetrachloroethane	79-34-5	UG/L	c	0.076	-	0.076	0	-	0	0																														
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	UG/L	n	5500	-	5500	0	-	0	0																														
1,1,2-Trichloroethane	79-00-5	UG/L	c	0.28	5	0.28	0	-	0	0																														
1,1-Dichloroethane	75-34-3	UG/L	c	2.8	-	2.8	0	-	0	0																														
1,1-Dichloroethene	75-35-4	UG/L	n	28	7	7	0	-	0	0																														
1,2,3-Trichlorobenzene	87-61-6	UG/L	n	0.7	-	0.7	0.33	-	0.33	1																									0.33	J				
1,2,4-Trichlorobenzene	120-82-1	UG/L	c	0.4	70	0.4	0.27	-	0.27	1																									0.27	J				
1,2-Dibromo-3-chloropropane	96-12-8	UG/L	c	0.00033	0.2	0.00033	0	-	0	0																														
1,2-Dibromoethane	106-93-4	UG/L	c	0.0075	0.05	0.0075	0	-	0	0																														
1,2-Dichlorobenzene	95-50-1	UG/L	n	30	600	30	0	-	0	0																														
1,2-Dichloroethane	107-06-2	UG/L	c	0.17	5	0.17	0	-	0	0																														
1,2-Dichloropropane	78-87-5	UG/L	c	0.44	5	0.44	0	-	0	0																														
1,3-Dichlorobenzene	541-73-1	UG/L	-	-	-	-	0.6	-	0.77	2									0.6																0.77					
1,4-Dichlorobenzene	106-46-7	UG/L	c	0.48	75	0.48	1.2	-	3.1	7									1.9				1.2				3.1		1.6				2.6		1.2					
2-Butanone	78-93-3	UG/L	n	560	-	560	0	-	0	0																														
2-Hexanone	591-78-6	UG/L	n	3.8	-	3.8	0	-	0	0																														
4-Methyl-2-pentanone	108-10-1	UG/L	n	630	-	630	0	-	0	0																														
Acetone	67-64-1	UG/L	n	1400	-	1400	11	-	11	1																							11							
Benzene	71-43-2	UG/L	c	0.46	5	0.46	1.5	-	1.6	3																									1.5		1.6		1.6	
Bromochloromethane	74-97-5	UG/L	n	8.3	-	8.3	0	-	0	0																														
Bromodichloromethane	75-27-4	UG/L	c	0.13	80	0.13	0	-	0	0																														
Bromoform	75-25-2	UG/L	c	3.3	80	3.3	0	-	0	0																														
Bromomethane	74-83-9	UG/L	n	0.75	-	0.75	0	-	0	0																														
Carbon disulfide	75-15-0	UG/L	n	81	-	81	0	-	0	0																														
Carbon tetrachloride	56-23-5	UG/L	c	0.46	5	0.46	0	-	0	0																														
Chlorobenzene	108-90-7	UG/L	n	7.8	100	7.8	1.9	-	63	11									29				12				19		10				2		63		3.1		3.1	
Chloroethane	75-00-3	UG/L	n	2100	-	2100	0	-	0	0																														
Chloroform	67-66-3	UG/L	c	0.22	80	0.22	0	-	0	0																														
Chloromethane	74-87-3	UG/L	n	19	-	19	0	-	0	0																														
cis-1,2-Dichloroethene	156-59-2	UG/L	n	3.6	70	3.6	0	-	0	0																														
cis-1,3-Dichloropropene	10061-01-5	UG/L	-	0.47	-	0.47	0	-	0	0																														
Cyclohexane	110-82-7	UG/L	n	1300	-	1300	0.23	-	0.51	2																														
Dibromochloromethane	124-48-1	UG/L	c	0.87	80	0.87	0	-	0	0																														
Dichlorodifluoromethane	75-71-8	UG/L	n	20	-	20	0	-	0	0																														
Ethylbenzene	100-41-4	UG/L	c	1.5	700	1.5	0	-	0	0																														
Isopropylbenzene	98-82-8	UG/L	n	45	-	45	1.1	-	6.4	5									6.4				2.3										1.1		2					
m,p-Xylene	179601-23-1	UG/L	-	19	-	19	0.18	-	0.24	2																							0.18	J	0.24	J				
Methyl acetate	79-20-9	UG/L	n	2000	-	2000	0	-	0	0																														
Methyl tert-butyl ether	1634-04-4	UG/L	c	14	-	14	0.19	-	3.2	4									2.5														0.19	J	3					
Methylcyclohexane	108-87-2	UG/L	-	-	-	-	0.2	-	0.43	4																							0.2	J	0.4	J				
Methylene chloride	75-09-2	UG/L	c	11	5	5	0.3	-	1.8	3			1.8	J																										
o-Xylene	95-47-6	UG/L	n	19		19	0.2	-	0.32	4													0.2	J									0.25	J	0.21	J				
Styrene	100-42-5	UG/L	n	120	100	100	0	-	0	0																														
Tetrachloroethene	127-18-4	UG/L	c	4.1	5	4.1	0	-	0	0																														
Toluene	108-88-3	UG/L	n	110	1000	110	0.17	-	1.6	7							1.1	J					0.23	J									0.17	J	0.25	J				
trans-1,2-Dichloroethene	156-60-5	UG/L	n	36	100	36	0	-	0	0																														
trans-1,3-Dichloropropene	10061-02-6	UG/L	-	0.47	-	0.47	0	-	0	0																														
Trichloroethene	79-01-6	UG/L	n	0.28	5	0.28	2.3	-	2.3	1															2.3	J														
Trichlorofluoromethane	75-69-4	UG/L	n	520	-	520	0	-	0	0																														
Vinyl chloride	75-01-4	UG/L	c	0.019	2	0.019	0	-	0	0																														

Table 4-2a

Volatile Organic Compounds (VOCs) Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW20I		MW20S		MW34D		MW34S		MW36		MW37	
											03/05/14		03/05/14		03/14/14		03/14/14		03/19/14		03/19/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1,1-Trichloroethane	71-55-6	UG/L	n	800	200	200	0	-	0	0												
1,1,2,2-Tetrachloroethane	79-34-5	UG/L	c	0.076	-	0.076	0	-	0	0												
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	UG/L	n	5500	-	5500	0	-	0	0												
1,1,2-Trichloroethane	79-00-5	UG/L	c	0.28	5	0.28	0	-	0	0												
1,1-Dichloroethane	75-34-3	UG/L	c	2.8	-	2.8	0	-	0	0												
1,1-Dichloroethene	75-35-4	UG/L	n	28	7	7	0	-	0	0												
1,2,3-Trichlorobenzene	87-61-6	UG/L	n	0.7	-	0.7	0.33	-	0.33	1												
1,2,4-Trichlorobenzene	120-82-1	UG/L	c	0.4	70	0.4	0.27	-	0.27	1												
1,2-Dibromo-3-chloropropane	96-12-8	UG/L	c	0.00033	0.2	0.00033	0	-	0	0												
1,2-Dibromoethane	106-93-4	UG/L	c	0.0075	0.05	0.0075	0	-	0	0												
1,2-Dichlorobenzene	95-50-1	UG/L	n	30	600	30	0	-	0	0												
1,2-Dichloroethane	107-06-2	UG/L	c	0.17	5	0.17	0	-	0	0												
1,2-Dichloropropane	78-87-5	UG/L	c	0.44	5	0.44	0	-	0	0												
1,3-Dichlorobenzene	541-73-1	UG/L	-	-	-	-	0.6	-	0.77	2												
1,4-Dichlorobenzene	106-46-7	UG/L	c	0.48	75	0.48	1.2	-	3.1	7							2.6					
2-Butanone	78-93-3	UG/L	n	560	-	560	0	-	0	0												
2-Hexanone	591-78-6	UG/L	n	3.8	-	3.8	0	-	0	0												
4-Methyl-2-pentanone	108-10-1	UG/L	n	630	-	630	0	-	0	0												
Acetone	67-64-1	UG/L	n	1400	-	1400	11	-	11	1												
Benzene	71-43-2	UG/L	c	0.46	5	0.46	1.5	-	1.6	3												
Bromochloromethane	74-97-5	UG/L	n	8.3	-	8.3	0	-	0	0												
Bromodichloromethane	75-27-4	UG/L	c	0.13	80	0.13	0	-	0	0												
Bromoform	75-25-2	UG/L	c	3.3	80	3.3	0	-	0	0												
Bromomethane	74-83-9	UG/L	n	0.75	-	0.75	0	-	0	0												
Carbon disulfide	75-15-0	UG/L	n	81	-	81	0	-	0	0												
Carbon tetrachloride	56-23-5	UG/L	c	0.46	5	0.46	0	-	0	0												
Chlorobenzene	108-90-7	UG/L	n	7.8	100	7.8	1.9	-	63	11							23		1.9		17	
Chloroethane	75-00-3	UG/L	n	2100	-	2100	0	-	0	0												
Chloroform	67-66-3	UG/L	c	0.22	80	0.22	0	-	0	0												
Chloromethane	74-87-3	UG/L	n	19	-	19	0	-	0	0												
cis-1,2-Dichloroethene	156-59-2	UG/L	n	3.6	70	3.6	0	-	0	0												
cis-1,3-Dichloropropene	10061-01-5	UG/L	-	0.47	-	0.47	0	-	0	0												
Cyclohexane	110-82-7	UG/L	n	1300	-	1300	0.23	-	0.51	2							0.51				0.23	J
Dibromochloromethane	124-48-1	UG/L	c	0.87	80	0.87	0	-	0	0												
Dichlorodifluoromethane	75-71-8	UG/L	n	20	-	20	0	-	0	0												
Ethylbenzene	100-41-4	UG/L	c	1.5	700	1.5	0	-	0	0												
Isopropylbenzene	98-82-8	UG/L	n	45	-	45	1.1	-	6.4	5							1.1					
m,p-Xylene	179601-23-1	UG/L	-	19	-	19	0.18	-	0.24	2												
Methyl acetate	79-20-9	UG/L	n	2000	-	2000	0	-	0	0												
Methyl tert-butyl ether	1634-04-4	UG/L	c	14	-	14	0.19	-	3.2	4											3.2	
Methylcyclohexane	108-87-2	UG/L	-	-	-	-	0.2	-	0.43	4							0.36	J			0.43	J
Methylene chloride	75-09-2	UG/L	c	11	5	5	0.3	-	1.8	3									0.37	J	0.3	J
o-Xylene	95-47-6	UG/L	n	19		19	0.2	-	0.32	4											0.32	J
Styrene	100-42-5	UG/L	n	120	100	100	0	-	0	0												
Tetrachloroethene	127-18-4	UG/L	c	4.1	5	4.1	0	-	0	0												
Toluene	108-88-3	UG/L	n	110	1000	110	0.17	-	1.6	7	1.6	J	1.2	J							0.22	J
trans-1,2-Dichloroethene	156-60-5	UG/L	n	36	100	36	0	-	0	0												
trans-1,3-Dichloropropene	10061-02-6	UG/L	-	0.47	-	0.47	0	-	0	0												
Trichloroethene	79-01-6	UG/L	n	0.28	5	0.28	2.3	-	2.3	1												
Trichlorofluoromethane	75-69-4	UG/L	n	520	-	520	0	-	0	0												
Vinyl chloride	75-01-4	UG/L	c	0.019	2	0.019	0	-	0	0												

Volatile Organic Compounds (VOCs) Detected in Landfill Area Groundwater (December 2014)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW01D	MW01S	MW02	MW03	MW04	MW05D	MW05S	MW06	MW07D	MW07S	MW09	MW11	MW12	MW20D	MW20D-DUP	MW20I
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,1,1-Trichloroethane	71-55-6	ug/L	n	800	200	200	0 - 0	0																
1,1,2,2-Tetrachloroethane	79-34-5	ug/L	c	0.076	-	0.076	0 - 0	0																
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ug/L	n	5500	-	5500	0 - 0	0																
1,1,2-Trichloroethane	79-00-5	ug/L	c	0.28	5	0.28	0 - 0	0																
1,1-Dichloroethane	75-34-3	ug/L	c	2.8	-	2.8	0 - 0	0																
1,1-Dichloroethene	75-35-4	ug/L	n	28	7	7	0.092 - 0.092	1	0.092 J															
1,2,3-Trichlorobenzene	87-61-6	ug/L	n	0.7	-	0.7	0 - 0	0																
1,2,4-Trichlorobenzene	120-82-1	ug/L	n	0.4	70	0.4	0 - 0	0																
1,2-Dibromo-3-chloropropane	96-12-8	ug/L	c	0.00033	0.2	0.00033	0 - 0	0																
1,2-Dibromoethane	106-93-4	ug/L	c	0.0075	0.05	0.0075	0 - 0	0																
1,2-Dichlorobenzene	95-50-1	ug/L	n	30	600	30	0.14 - 0.69	8					0.25 J			0.23 J	0.69	0.29 J		0.65 J	0.24 J			
1,2-Dichloroethane	107-06-2	ug/L	c	0.17	5	0.17	0 - 0	0																
1,2-Dichloropropane	78-87-5	ug/L	c	0.44	5	0.44	0 - 0	0																
1,3-Dichlorobenzene	541-73-1	ug/L	-	-	-	-	0.2 - 1	5					0.84				0.22 J			0.94 J	1			
1,4-Dichlorobenzene	106-46-7	ug/L	c	0.48	75	0.48	0.11 - 4.8	11				0.11 J	2.6		1.1	1.6	3.8	2		4.3 J	2			
2-Butanone	78-93-3	ug/L	n	560	-	560	2.9 - 6	2												2.9 J				
2-Hexanone	591-78-6	ug/L	n	3.8	-	3.8	0 - 0	0																
4-Methyl-2-pentanone	108-10-1	ug/L	n	630	-	630	0 - 0	0																
Acetone	67-64-1	ug/L	n	1400	-	1400	4.9 - 47	8						20		5.7	4.9 J	4.9 J					6.1	
Benzene	71-43-2	ug/L	c	0.46	5	0.46	0.11 - 3	14	0.25 J				0.16 J		0.14 J	0.16 J	0.33 J	0.11 J		0.52 J	0.44 J	0.42 J	0.59	0.11 J
Bromochloromethane	74-97-5	ug/L	n	8.3	-	8.3	0 - 0	0																
Bromodichloromethane	75-27-4	ug/L	c	0.13	80	0.13	0 - 0	0																
Bromoform	75-25-2	ug/L	c	3.3	80	3.3	0 - 0	0																
Bromomethane	74-83-9	ug/L	n	0.75	-	0.75	0 - 0	0																
Carbon disulfide	75-15-0	ug/L	n	81	-	81	0.071 - 19	6		0.071 J			0.16 J							0.68 J			1.8	0.27 J
Carbon tetrachloride	56-23-5	ug/L	c	0.46	5	0.46	0 - 0	0																
Chlorobenzene	108-90-7	ug/L	n	7.8	100	7.8	0.24 - 93	18	0.69		3	1.1	34		21 J	5.9	26	13		12 J	93	1.2	1.6 J	0.34 J
Chloroethane	75-00-3	ug/L	n	2100	-	2100	0 - 0	0																
Chloroform	67-66-3	ug/L	c	0.22	80	0.22	0 - 0	0																
Chloromethane	74-87-3	ug/L	n	19	-	19	0 - 0	0																
cis-1,2-Dichloroethene	156-59-2	ug/L	n	3.6	70	3.6	0.074 - 0.14	10	0.14 J		0.095 J	0.083 J	0.091 J			0.074 J	0.12 J	0.12 J		0.12 J	0.098 J			
cis-1,3-Dichloropropene	10061-01-5	ug/L	c	0.47	-	0.47	0.23 - 0.23	1												0.23 J				
Cyclohexane	110-82-7	ug/L	n	1300	-	1300	0.39 - 0.88	2		0.39 J														
Dibromochloromethane	124-48-1	ug/L	c	0.87	80	0.87	0.1 - 0.1	1												0.1 J				
Dichlorodifluoromethane	75-71-8	ug/L	n	20	-	20	0 - 0	0																
Ethylbenzene	100-41-4	ug/L	c	1.5	700	1.5	0.056 - 0.22	3												0.1 J				
Isopropylbenzene	98-82-8	ug/L	n	45	-	45	0.97 - 5	6					5 J		2.9 J	0.97 J				2.7 J	1.6 J			
m,p-Xylene	179601-23-1	ug/L	n	19	-	19	0.16 - 0.36	5	0.17 J											0.36 J	0.23 J			
Methyl acetate	79-20-9	ug/L	n	2000	-	2000	0 - 0	0																
Methyl tert-Butyl Ether	1634-04-4	ug/L	c	14	-	14	0.061 - 3.8	9			0.72	1.8	2.8							0.28 J	2.1			
Methylcyclohexane	108-87-2	ug/L	-	-	-	-	0.077 - 0.54	6		0.094 J						0.087 J				0.54 J	0.24 J			
Methylene chloride	75-09-2	ug/L	c	11	5	5	0.61 - 0.61	1																
o-Xylene	95-47-6	ug/L	n	19		19	0.14 - 0.39	7	0.18 J						0.21 J					0.39 J	0.22 J			
Styrene	100-42-5	ug/L	n	120	100	100	0 - 0	0																
Tetrachloroethene	127-18-4	ug/L	n	4.1	5	4.1	0 - 0	0																
Toluene	108-88-3	ug/L	n	110	1000	110	0.062 - 0.31	14	0.18 J		0.07 J		0.12 J		0.087 J	0.14 J	0.098 J			0.29 J	0.16 J	0.076 J	0.2 J	
trans-1,2-Dichloroethene	156-60-5	ug/L	n	36	100	36	0 - 0	0																
trans-1,3-Dichloropropene	10061-02-6	ug/L	c	0.47	-	0.47	0 - 0	0																
Trichloroethene	79-01-6	ug/L	n	0.28	5	0.28	0 - 0	0																
Trichlorofluoromethane	75-69-4	ug/L	n	520	-	520	0 - 0	0																
Vinyl chloride	75-01-4	ug/L	c	0.019	2	0.019	0 - 0	0																

Volatile Organic Compounds (VOCs) Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW20S		MW34D		MW34S		MW36		MW37	
											Result		Result		Result		Result		Result	
1,1,1-Trichloroethane	71-55-6	ug/L	n	800	200	200	0	-	0	0										
1,1,2,2-Tetrachloroethane	79-34-5	ug/L	c	0.076	-	0.076	0	-	0	0										
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ug/L	n	5500	-	5500	0	-	0	0										
1,1,2-Trichloroethane	79-00-5	ug/L	c	0.28	5	0.28	0	-	0	0										
1,1-Dichloroethane	75-34-3	ug/L	c	2.8	-	2.8	0	-	0	0										
1,1-Dichloroethene	75-35-4	ug/L	n	28	7	7	0.092	-	0.092	1										
1,2,3-Trichlorobenzene	87-61-6	ug/L	n	0.7	-	0.7	0	-	0	0										
1,2,4-Trichlorobenzene	120-82-1	ug/L	n	0.4	70	0.4	0	-	0	0										
1,2-Dibromo-3-chloropropane	96-12-8	ug/L	c	0.00033	0.2	0.00033	0	-	0	0										
1,2-Dibromoethane	106-93-4	ug/L	c	0.0075	0.05	0.0075	0	-	0	0										
1,2-Dichlorobenzene	95-50-1	ug/L	n	30	600	30	0.14	-	0.69	8					0.44	J			0.14	J
1,2-Dichloroethane	107-06-2	ug/L	c	0.17	5	0.17	0	-	0	0										
1,2-Dichloropropane	78-87-5	ug/L	c	0.44	5	0.44	0	-	0	0										
1,3-Dichlorobenzene	541-73-1	ug/L	-	-	-	-	0.2	-	1	5					0.2	J				
1,4-Dichlorobenzene	106-46-7	ug/L	c	0.48	75	0.48	0.11	-	4.8	11					4.8		0.22	J	0.53	
2-Butanone	78-93-3	ug/L	n	560	-	560	2.9	-	6	2	6									
2-Hexanone	591-78-6	ug/L	n	3.8	-	3.8	0	-	0	0										
4-Methyl-2-pentanone	108-10-1	ug/L	n	630	-	630	0	-	0	0										
Acetone	67-64-1	ug/L	n	1400	-	1400	4.9	-	47	8	47						7.9		8.4	
Benzene	71-43-2	ug/L	c	0.46	5	0.46	0.11	-	3	14	3				0.3	J			0.19	J
Bromochloromethane	74-97-5	ug/L	n	8.3	-	8.3	0	-	0	0										
Bromodichloromethane	75-27-4	ug/L	c	0.13	80	0.13	0	-	0	0										
Bromoform	75-25-2	ug/L	c	3.3	80	3.3	0	-	0	0										
Bromomethane	74-83-9	ug/L	n	0.75	-	0.75	0	-	0	0										
Carbon disulfide	75-15-0	ug/L	n	81	-	81	0.071	-	19	6	19									
Carbon tetrachloride	56-23-5	ug/L	c	0.46	5	0.46	0	-	0	0										
Chlorobenzene	108-90-7	ug/L	n	7.8	100	7.8	0.24	-	93	18	5.3		0.24	J	43		3.5		14	
Chloroethane	75-00-3	ug/L	n	2100	-	2100	0	-	0	0										
Chloroform	67-66-3	ug/L	c	0.22	80	0.22	0	-	0	0										
Chloromethane	74-87-3	ug/L	n	19	-	19	0	-	0	0										
cis-1,2-Dichloroethene	156-59-2	ug/L	n	3.6	70	3.6	0.074	-	0.14	10					0.096	J				
cis-1,3-Dichloropropene	10061-01-5	ug/L	c	0.47	-	0.47	0.23	-	0.23	1										
Cyclohexane	110-82-7	ug/L	n	1300	-	1300	0.39	-	0.88	2					0.88					
Dibromochloromethane	124-48-1	ug/L	c	0.87	80	0.87	0.1	-	0.1	1										
Dichlorodifluoromethane	75-71-8	ug/L	n	20	-	20	0	-	0	0										
Ethylbenzene	100-41-4	ug/L	c	1.5	700	1.5	0.056	-	0.22	3	0.22	J			0.056	J				
Isopropylbenzene	98-82-8	ug/L	n	45	-	45	0.97	-	5	6					2.3					
m,p-Xylene	179601-23-1	ug/L	n	19	-	19	0.16	-	0.36	5	0.16	J			0.24	J				
Methyl acetate	79-20-9	ug/L	n	2000	-	2000	0	-	0	0										
Methyl tert-Butyl Ether	1634-04-4	ug/L	c	14	-	14	0.061	-	3.8	9			0.23	J	0.061	J	0.39	J	3.8	
Methylcyclohexane	108-87-2	ug/L	-	-	-	-	0.077	-	0.54	6					0.49	J			0.077	J
Methylene chloride	75-09-2	ug/L	c	11	5	5	0.61	-	0.61	1	0.61									
o-Xylene	95-47-6	ug/L	n	19		19	0.14	-	0.39	7	0.14	J			0.31	J			0.26	J
Styrene	100-42-5	ug/L	n	120	100	100	0	-	0	0										
Tetrachloroethene	127-18-4	ug/L	n	4.1	5	4.1	0	-	0	0										
Toluene	108-88-3	ug/L	n	110	1000	110	0.062	-	0.31	14	0.31	J			0.18	J	0.062	J	0.14	J
trans-1,2-Dichloroethene	156-60-5	ug/L	n	36	100	36	0	-	0	0										
trans-1,3-Dichloropropene	10061-02-6	ug/L	c	0.47	-	0.47	0	-	0	0										
Trichloroethene	79-01-6	ug/L	n	0.28	5	0.28	0	-	0	0										
Trichlorofluoromethane	75-69-4	ug/L	n	520	-	520	0	-	0	0										
Vinyl chloride	75-01-4	ug/L	c	0.019	2	0.019	0	-	0	0										

Table 4-2c

Volatile Organic Compounds (VOCs) Detected in Landfill Area Groundwater (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range	Frequency	MW01D Result	MW01S Result	MW02 Result	MW03 Result	MW04 Result	MW05D Result	MW05S Result	MW06 Result	MW07D Result	MW07S Result	MW09 Result	MW11 Result	MW12 Result	MW20D Result
1,1,1-Trichloroethane	71-55-6	n	800	200	200	UG/L	0 - 0	0														
1,1,2,2-Tetrachloroethane	79-34-5	c	0.076	-	0.076	UG/L	0 - 0	0														
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	n	5500	-	5500	UG/L	0 - 0	0														
1,1,2-Trichloroethane	79-00-5	c	0.28	5	0.28	UG/L	0 - 0	0														
1,1-Dichloroethane	75-34-3	c	2.8	-	2.8	UG/L	0 - 0	0														
1,1-Dichloroethene	75-35-4	n	28	7	7	UG/L	0 - 0	0														
1,2,3-Trichlorobenzene	87-61-6	n	0.7	-	0.7	UG/L	0 - 0	0														
1,2,4-Trichlorobenzene	120-82-1	n	0.4	70	0.4	UG/L	0 - 0	0														
1,2-Dibromo-3-chloropropane	96-12-8	c	0.00033	0.2	0.00033	UG/L	0 - 0	0														
1,2-Dibromoethane(EDB)	106-93-4	c	0.0075	0.05	0.0075	UG/L	0 - 0	0														
1,2-Dichlorobenzene	95-50-1	n	30	600	30	UG/L	0.23 - 0.56	8					0.36 J			0.38 J	0.56	0.28 J		0.44 J	0.27 J	
1,2-Dichloroethane	107-06-2	c	0.17	5	0.17	UG/L	0 - 0	0														
1,2-Dichloropropane	78-87-5	c	0.44	5	0.44	UG/L	0 - 0	0														
1,3-Dichlorobenzene	541-73-1	-	-	-	-	UG/L	0.26 - 1	4					1							0.74	1	
1,4-Dichlorobenzene	106-46-7	c	0.48	75	0.48	UG/L	0.35 - 3.3	10					2.6		1.1	2	2.9	1.8		3.3	2	
2-Butanone	78-93-3	n	560	-	560	UG/L	0 - 0	0														
2-Hexanone	591-78-6	n	3.8	-	3.8	UG/L	0 - 0	0														
4-Methyl-2-pentanone	108-10-1	n	630	-	630	UG/L	0 - 0	0														
Acetone	67-64-1	n	1400	-	1400	UG/L	5.4 - 14	4				14								14		
Benzene	71-43-2	c	0.46	5	0.46	UG/L	0.27 - 1.6	6					0.34 J				0.27 J			0.48 J	0.31 J	
Bromochloromethane	74-97-5	n	8.3	-	8.3	UG/L	0 - 0	0														
Bromodichloromethane	75-27-4	c	0.13	80	0.13	UG/L	0 - 0	0														
Bromoform	75-25-2	c	3.3	80	3.3	UG/L	0 - 0	0														
Bromomethane	74-83-9	n	0.75	-	0.75	UG/L	0 - 0	0														
Carbon disulfide	75-15-0	n	81	-	81	UG/L	0.21 - 16	5											0.23 J	0.71		
Carbon tetrachloride	56-23-5	c	0.46	5	0.46	UG/L	0 - 0	0														
Chlorobenzene	108-90-7	n	7.8	100	7.8	UG/L	0.83 - 51	14			1.5	0.83	47		13	8.4	17	9.6		8.9	51	0.86
Chloroethane	75-00-3	n	2100	-	2100	UG/L	0 - 0	0														
Chloroform	67-66-3	c	0.22	80	0.22	UG/L	0 - 0	0														
Chloromethane	74-87-3	n	19	-	19	UG/L	0 - 0	0														
cis-1,2-Dichloroethene	156-59-2	n	3.6	70	3.6	UG/L	0 - 0	0														
cis-1,3-Dichloropropene	10061-01-5	c	0.47	-	0.47	UG/L	0 - 0	0														
Cyclohexane	110-82-7	n	1300	-	1300	UG/L	0.27 - 0.59	2														
Dibromochloromethane	124-48-1	c	0.87	80	0.87	UG/L	0 - 0	0														
Dichlorodifluoromethane	75-71-8	n	20	-	20	UG/L	0 - 0	0														
Ethylbenzene	100-41-4	c	1.5	700	1.5	UG/L	0 - 0	0														
Isopropylbenzene (Cumene)	98-82-8	n	45	-	45	UG/L	0.96 - 5	7					5		2.3	1.6				2	3	
m,p-Xylene	179601-23-1	n	19	-	19	UG/L	0.23 - 0.34	4					0.33 J								0.27 J	
Methyl Acetate	79-20-9	n	2000	-	2000	UG/L	0 - 0	0														
Methyl tert-butyl ether	1634-04-4	c	14	-	14	UG/L	0.21 - 3.1	7			0.38 J	1.5	3.1								2.6	
Methylcyclohexane	108-87-2	-	-	-	-	UG/L	0.27 - 0.92	5					0.32 J			0.27 J				0.46 J	0.92	
Methylene chloride	75-09-2	c	11	5	5	UG/L	0.44 - 0.44	1														
o-Xylene	95-47-6	n	19		19	UG/L	0.23 - 0.6	5							0.24 J					0.25 J	0.32 J	
Styrene	100-42-5	n	120	100	100	UG/L	0 - 0	0														
Tetrachloroethene	127-18-4	n	4.1	5	4.1	UG/L	0 - 0	0														
Toluene	108-88-3	n	110	1000	110	UG/L	0.21 - 0.21	2												0.21 J	0.21 J	
trans-1,2-Dichloroethene	156-60-5	n	36	100	36	UG/L	0 - 0	0														
trans-1,3-Dichloropropene	10061-02-6	c	0.47	-	0.47	UG/L	0 - 0	0														
Trichloroethene	79-01-6	n	0.28	5	0.28	UG/L	0 - 0	0														
Trichlorofluoromethane	75-69-4	n	520	-	520	UG/L	0 - 0	0														
Vinyl chloride	75-01-4	c	0.019	2	0.019	UG/L	0 - 0	0														

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-2c
Volatile Organic Compounds (VOCs) Detected in Landfill Area Groundwater (July 2015)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	MW20I		MW20S		MW34D		MW34S		MW36		MW37	
							Result		Result		Result		Result		Result		Result	
1,1,1-Trichloroethane	71-55-6	n	800	200	200	UG/L												
1,1,2,2-Tetrachloroethane	79-34-5	c	0.076	-	0.076	UG/L												
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	n	5500	-	5500	UG/L												
1,1,2-Trichloroethane	79-00-5	c	0.28	5	0.28	UG/L												
1,1-Dichloroethane	75-34-3	c	2.8	-	2.8	UG/L												
1,1-Dichloroethene	75-35-4	n	28	7	7	UG/L												
1,2,3-Trichlorobenzene	87-61-6	n	0.7	-	0.7	UG/L												
1,2,4-Trichlorobenzene	120-82-1	n	0.4	70	0.4	UG/L												
1,2-Dibromo-3-chloropropane	96-12-8	c	0.00033	0.2	0.00033	UG/L												
1,2-Dibromoethane(EDB)	106-93-4	c	0.0075	0.05	0.0075	UG/L												
1,2-Dichlorobenzene	95-50-1	n	30	600	30	UG/L							0.32	J			0.23	J
1,2-Dichloroethane	107-06-2	c	0.17	5	0.17	UG/L												
1,2-Dichloropropane	78-87-5	c	0.44	5	0.44	UG/L												
1,3-Dichlorobenzene	541-73-1	-	-	-	-	UG/L											0.26	J
1,4-Dichlorobenzene	106-46-7	c	0.48	75	0.48	UG/L							3.3		0.35	J	1.1	
2-Butanone	78-93-3	n	560	-	560	UG/L												
2-Hexanone	591-78-6	n	3.8	-	3.8	UG/L												
4-Methyl-2-pentanone	108-10-1	n	630	-	630	UG/L												
Acetone	67-64-1	n	1400	-	1400	UG/L									5.4		6.9	
Benzene	71-43-2	c	0.46	5	0.46	UG/L			1.6								0.36	J
Bromochloromethane	74-97-5	n	8.3	-	8.3	UG/L												
Bromodichloromethane	75-27-4	c	0.13	80	0.13	UG/L												
Bromoform	75-25-2	c	3.3	80	3.3	UG/L												
Bromomethane	74-83-9	n	0.75	-	0.75	UG/L												
Carbon disulfide	75-15-0	n	81	-	81	UG/L			16	J-			0.21	J			0.24	J
Carbon tetrachloride	56-23-5	c	0.46	5	0.46	UG/L												
Chlorobenzene	108-90-7	n	7.8	100	7.8	UG/L			4				32		4.3		26	
Chloroethane	75-00-3	n	2100	-	2100	UG/L												
Chloroform	67-66-3	c	0.22	80	0.22	UG/L												
Chloromethane	74-87-3	n	19	-	19	UG/L												
cis-1,2-Dichloroethene	156-59-2	n	3.6	70	3.6	UG/L												
cis-1,3-Dichloropropene	10061-01-5	c	0.47	-	0.47	UG/L												
Cyclohexane	110-82-7	n	1300	-	1300	UG/L							0.59				0.27	J
Dibromochloromethane	124-48-1	c	0.87	80	0.87	UG/L												
Dichlorodifluoromethane	75-71-8	n	20	-	20	UG/L												
Ethylbenzene	100-41-4	c	1.5	700	1.5	UG/L												
Isopropylbenzene (Cumene)	98-82-8	n	45	-	45	UG/L							1.4				0.96	
m,p-Xylene	179601-23-1	n	19	-	19	UG/L							0.23	J			0.34	J
Methyl Acetate	79-20-9	n	2000	-	2000	UG/L												
Methyl tert-butyl ether	1634-04-4	c	14	-	14	UG/L					0.21	J			0.43	J	2.5	
Methylcyclohexane	108-87-2	-	-	-	-	UG/L							0.42	J				
Methylene chloride	75-09-2	c	11	5	5	UG/L			0.44	J								
o-Xylene	95-47-6	n	19		19	UG/L							0.23	J			0.6	
Styrene	100-42-5	n	120	100	100	UG/L												
Tetrachloroethene	127-18-4	n	4.1	5	4.1	UG/L												
Toluene	108-88-3	n	110	1000	110	UG/L												
trans-1,2-Dichloroethene	156-60-5	n	36	100	36	UG/L												
trans-1,3-Dichloropropene	10061-02-6	c	0.47	-	0.47	UG/L												
Trichloroethene	79-01-6	n	0.28	5	0.28	UG/L												
Trichlorofluoromethane	75-69-4	n	520	-	520	UG/L												
Vinyl chloride	75-01-4	c	0.019	2	0.019	UG/L												

* USEPA Region III Regional Screening Level (RSL), November 2015
** Pennsylvania Maximum Contaminant Levels
Highlighted concentrations are over Project Screening Levels

Semivolatile Organic Compounds (SVOCs) Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06	
											03/10/14		03/10/14		03/10/14		03/11/14		03/20/14		03/18/14		03/18/14		03/11/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1'-Biphenyl	92-52-4	UG/L	n	0.083	-	0.083	0	-	0	0																
1,2,4,5-Tetrachlorobenzene	95-94-3	UG/L	n	0.17	-	0.17	0	-	0	0																
1,4-Dioxane	123-91-1	UG/L	c	0.46	-	0.46	2.3	-	110	19	110		4.1		15		13		14		8.4		16		11	
2,2'-Oxybis(1-chloropropane)	108-60-1	UG/L	n	71	-	71	0	-	0	0																
2,3,4,6-Tetrachlorophenol	58-90-2	UG/L	n	24	-	24	0	-	0	0																
2,4,5-Trichlorophenol	95-95-4	UG/L	n	120	-	120	0	-	0	0																
2,4,6-Trichlorophenol	88-06-2	UG/L	n	1.2	-	1.2	0	-	0	0																
2,4-Dichlorophenol	120-83-2	UG/L	n	4.6	-	4.6	0	-	0	0																
2,4-Dimethylphenol	105-67-9	UG/L	n	36	-	36	0	-	0	0																
2,4-Dinitrophenol	51-28-5	UG/L	n	3.9	-	3.9	0	-	0	0																
2,4-Dinitrotoluene	121-14-2	UG/L	c	0.24	-	0.24	0	-	0	0																
2,6-Dinitrotoluene	606-20-2	UG/L	c	0.049	-	0.049	0	-	0	0																
2-Chloronaphthalene	91-58-7	UG/L	n	75	-	75	0	-	0	0																
2-Chlorophenol	95-57-8	UG/L	n	9.1	-	9.1	0	-	0	0																
2-Methylnaphthalene	91-57-6	UG/L	n	3.6	-	3.6	0.097	-	1.3	5					0.11				0.097	J						
2-Methylphenol	95-48-7	UG/L	n	93	-	93	0	-	0	0																
2-Nitroaniline	88-74-4	UG/L	n	19	-	19	0	-	0	0																
2-Nitrophenol	88-75-5	UG/L	-	-	-	-	0	-	0	0																
3,3'-Dichlorobenzidine	91-94-1	UG/L	c	0.13	-	0.13	0	-	0	0																
3-Nitroaniline	99-09-2	UG/L	-	-	-	-	0	-	0	0																
4,6-Dinitro-2-methylphenol	534-52-1	UG/L	n	0.15	-	0.15	0	-	0	0																
4-Bromophenyl-phenylether	101-55-3	UG/L	-	-	-	-	0	-	0	0																
4-Chloro-3-methylphenol	59-50-7	UG/L	n	140	-	140	0	-	0	0																
4-Chloroaniline	106-47-8	UG/L	c	0.37	-	0.37	0	-	0	0																
4-Chlorophenyl-phenylether	7005-72-3	UG/L	-	-	-	-	0	-	0	0																
4-Methylphenol	106-44-5	UG/L	n	190	-	190	0	-	0	0																
4-Nitroaniline	100-01-6	UG/L	c	3.8	-	3.8	0	-	0	0																
4-Nitrophenol	100-02-7	UG/L	-	-	-	-	0	-	0	0																
Acenaphthene	83-32-9	UG/L	n	53	-	53	0.86	-	4.3	7			3.1						1.6				3		1.4	
Acenaphthylene	208-96-8	UG/L	-	-	-	-	0	-	0	0																
Acetophenone	98-86-2	UG/L	n	190	-	190	4.2	-	4.2	1																
Anthracene	120-12-7	UG/L	n	180	-	180	0.09	-	0.88	4			0.19													
Atrazine	1912-24-9	UG/L	c	0.3	3	0.3	0	-	0	0																
Benzaldehyde	100-52-7	UG/L	n	190	-	190	0	-	0	0																
Benzo(a)anthracene	56-55-3	UG/L	c	0.012	-	0.012	0	-	0	0																
Benzo(a)pyrene	50-32-8	UG/L	c	0.0034	0.2	0.0034	0.83	-	0.83	1																
Benzo(b)fluoranthene	205-99-2	UG/L	c	0.034	-	0.034	0	-	0	0																
Benzo(g,h,i)perylene	191-24-2	UG/L	-	-	-	-	0.57	-	0.57	1																
Benzo(k)fluoranthene	207-08-9	UG/L	c	0.34	-	0.34	0.53	-	0.53	1																

Table 4-3a

Semivolatile Organic Compounds (SVOCs) Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06	
											03/10/14		03/10/14		03/10/14		03/11/14		03/20/14		03/18/14		03/18/14		03/11/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Bis(2-chloroethoxy)methane	111-91-1	UG/L	n	5.9	-	5.9	0	-	0	0																
Bis(2-chloroethyl)ether	111-44-4	UG/L	c	0.014	-	0.014	0	-	0	0																
Bis(2-ethylhexyl)phthalate	117-81-7	UG/L	c	5.6	6	5.6	2.4	-	48	6	10								2.8	J						
Butylbenzylphthalate	85-68-7	UG/L	c	16	-	16	0	-	0	0																
Caprolactam	105-60-2	UG/L	n	990	-	990	0	-	0	0																
Carbazole	86-74-8	UG/L	-	-	-	-	0	-	0	0																
Chrysene	218-01-9	UG/L	c	3.4	-	3.4	0	-	0	0																
Dibenzo(a,h)anthracene	53-70-3	UG/L	c	0.0034	-	0.0034	0	-	0	0																
Dibenzofuran	132-64-9	UG/L	n	0.79	-	0.79	0	-	0	0																
Diethylphthalate	84-66-2	UG/L	n	1500	-	1500	3.2	-	4	2			3.2	J											4	J
Dimethylphthalate	131-11-3	UG/L	-	-	-	-	0	-	0	0																
Di-n-butylphthalate	84-74-2	UG/L	n	90	-	90	0	-	0	0																
Di-n-octylphthalate	117-84-0	UG/L	n	20	-	20	0	-	0	0																
Fluoranthene	206-44-0	UG/L	n	80	-	80	0.091	-	6.8	4			0.37												0.12	
Fluorene	86-73-7	UG/L	n	29	-	29	0.16	-	3.7	7									1.3				2.8	J		
Hexachlorobenzene	118-74-1	UG/L	c	0.0098	1	0.0098	0	-	0	0																
Hexachlorobutadiene	87-68-3	UG/L	c	0.14	-	0.14	0	-	0	0																
Hexachlorocyclopentadiene	77-47-4	UG/L	n	0.041	50	0.041	0	-	0	0																
Hexachloroethane	67-72-1	UG/L	c	0.33	-	0.33	0	-	0	0																
Indeno(1,2,3-cd)pyrene	193-39-5	UG/L	c	0.034	-	0.034	0.48	-	0.48	1																
Isophorone	78-59-1	UG/L	c	78	-	78	0	-	0	0																
Naphthalene	91-20-3	UG/L	c	0.17	-	0.17	0	-	0	0																
Nitrobenzene	98-95-3	UG/L	c	0.14	-	0.14	0	-	0	0																
N-Nitroso-di-n-propylamine	621-64-7	UG/L	c	0.011	-	0.011	0	-	0	0																
N-Nitrosodiphenylamine	86-30-6	UG/L	c	12	-	12	3.1	-	3.1	1																
Pentachlorophenol	87-86-5	UG/L	c	0.041	1	0.041	0	-	0	0																
Phenanthrene	85-01-8	UG/L	-	-	-	-	0.09	-	8.6	8			2.4	J					0.51				2.5		0.09	J
Phenol	108-95-2	UG/L	n	580	-	580	0	-	0	0																
Pyrene	129-00-0	UG/L	n	12	-	12	0.21	-	5.2	3			0.21													

Semivolatile Organic Compounds (SVOCs) Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW07D		MW07S		MW09		MW11		MW12		MW20D		MW20D-DUP		MW20I	
											03/25/14		03/25/14		03/11/14		03/25/14		03/19/14		03/26/14		03/26/14		03/05/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1'-Biphenyl	92-52-4	UG/L	n	0.083	-	0.083	0	-	0	0																
1,2,4,5-Tetrachlorobenzene	95-94-3	UG/L	n	0.17	-	0.17	0	-	0	0																
1,4-Dioxane	123-91-1	UG/L	c	0.46	-	0.46	2.3	-	110	19	4.7		2.3				63		78		41		39		9.5	
2,2'-Oxybis(1-chloropropane)	108-60-1	UG/L	n	71	-	71	0	-	0	0																
2,3,4,6-Tetrachlorophenol	58-90-2	UG/L	n	24	-	24	0	-	0	0																
2,4,5-Trichlorophenol	95-95-4	UG/L	n	120	-	120	0	-	0	0																
2,4,6-Trichlorophenol	88-06-2	UG/L	n	1.2	-	1.2	0	-	0	0																
2,4-Dichlorophenol	120-83-2	UG/L	n	4.6	-	4.6	0	-	0	0																
2,4-Dimethylphenol	105-67-9	UG/L	n	36	-	36	0	-	0	0																
2,4-Dinitrophenol	51-28-5	UG/L	n	3.9	-	3.9	0	-	0	0																
2,4-Dinitrotoluene	121-14-2	UG/L	c	0.24	-	0.24	0	-	0	0																
2,6-Dinitrotoluene	606-20-2	UG/L	c	0.049	-	0.049	0	-	0	0																
2-Chloronaphthalene	91-58-7	UG/L	n	75	-	75	0	-	0	0																
2-Chlorophenol	95-57-8	UG/L	n	9.1	-	9.1	0	-	0	0																
2-Methylnaphthalene	91-57-6	UG/L	n	3.6	-	3.6	0.097	-	1.3	5							1.3		0.18							
2-Methylphenol	95-48-7	UG/L	n	93	-	93	0	-	0	0																
2-Nitroaniline	88-74-4	UG/L	n	19	-	19	0	-	0	0																
2-Nitrophenol	88-75-5	UG/L	-	-	-	-	0	-	0	0																
3,3'-Dichlorobenzidine	91-94-1	UG/L	c	0.13	-	0.13	0	-	0	0																
3-Nitroaniline	99-09-2	UG/L	-	-	-	-	0	-	0	0																
4,6-Dinitro-2-methylphenol	534-52-1	UG/L	n	0.15	-	0.15	0	-	0	0																
4-Bromophenyl-phenylether	101-55-3	UG/L	-	-	-	-	0	-	0	0																
4-Chloro-3-methylphenol	59-50-7	UG/L	n	140	-	140	0	-	0	0																
4-Chloroaniline	106-47-8	UG/L	c	0.37	-	0.37	0	-	0	0																
4-Chlorophenyl-phenylether	7005-72-3	UG/L	-	-	-	-	0	-	0	0																
4-Methylphenol	106-44-5	UG/L	n	190	-	190	0	-	0	0																
4-Nitroaniline	100-01-6	UG/L	c	3.8	-	3.8	0	-	0	0																
4-Nitrophenol	100-02-7	UG/L	-	-	-	-	0	-	0	0																
Acenaphthene	83-32-9	UG/L	n	53	-	53	0.86	-	4.3	7							4.3	J	3.9	J						
Acenaphthylene	208-96-8	UG/L	-	-	-	-	0	-	0	0																
Acetophenone	98-86-2	UG/L	n	190	-	190	4.2	-	4.2	1			4.2	J												
Anthracene	120-12-7	UG/L	n	180	-	180	0.09	-	0.88	4							0.88		0.4							
Atrazine	1912-24-9	UG/L	c	0.3	3	0.3	0	-	0	0																
Benzaldehyde	100-52-7	UG/L	n	190	-	190	0	-	0	0																
Benzo(a)anthracene	56-55-3	UG/L	c	0.012	-	0.012	0	-	0	0																
Benzo(a)pyrene	50-32-8	UG/L	c	0.0034	0.2	0.0034	0.83	-	0.83	1							0.83									
Benzo(b)fluoranthene	205-99-2	UG/L	c	0.034	-	0.034	0	-	0	0																
Benzo(g,h,i)perylene	191-24-2	UG/L	-	-	-	-	0.57	-	0.57	1							0.57	J								
Benzo(k)fluoranthene	207-08-9	UG/L	c	0.34	-	0.34	0.53	-	0.53	1							0.53									

Table 4-3a

Semivolatile Organic Compounds (SVOCs) Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW07D		MW07S		MW09		MW11		MW12		MW20D		MW20D-DUP		MW20I	
											03/25/14		03/25/14		03/11/14		03/25/14		03/19/14		03/26/14		03/26/14		03/05/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Bis(2-chloroethoxy)methane	111-91-1	UG/L	n	5.9	-	5.9	0	-	0	0																
Bis(2-chloroethyl)ether	111-44-4	UG/L	c	0.014	-	0.014	0	-	0	0																
Bis(2-ethylhexyl)phthalate	117-81-7	UG/L	c	5.6	6	5.6	2.4	-	48	6							48				31		43		2.4	J
Butylbenzylphthalate	85-68-7	UG/L	c	16	-	16	0	-	0	0																
Caprolactam	105-60-2	UG/L	n	990	-	990	0	-	0	0																
Carbazole	86-74-8	UG/L	-	-	-	-	0	-	0	0																
Chrysene	218-01-9	UG/L	c	3.4	-	3.4	0	-	0	0																
Dibenzo(a,h)anthracene	53-70-3	UG/L	c	0.0034	-	0.0034	0	-	0	0																
Dibenzofuran	132-64-9	UG/L	n	0.79	-	0.79	0	-	0	0																
Diethylphthalate	84-66-2	UG/L	n	1500	-	1500	3.2	-	4	2																
Dimethylphthalate	131-11-3	UG/L	-	-	-	-	0	-	0	0																
Di-n-butylphthalate	84-74-2	UG/L	n	90	-	90	0	-	0	0																
Di-n-octylphthalate	117-84-0	UG/L	n	20	-	20	0	-	0	0																
Fluoranthene	206-44-0	UG/L	n	80	-	80	0.091	-	6.8	4							6.8									
Fluorene	86-73-7	UG/L	n	29	-	29	0.16	-	3.7	7	0.16		0.41				3.7	J	2.1	J						
Hexachlorobenzene	118-74-1	UG/L	c	0.0098	1	0.0098	0	-	0	0																
Hexachlorobutadiene	87-68-3	UG/L	c	0.14	-	0.14	0	-	0	0																
Hexachlorocyclopentadiene	77-47-4	UG/L	n	0.041	50	0.041	0	-	0	0																
Hexachloroethane	67-72-1	UG/L	c	0.33	-	0.33	0	-	0	0																
Indeno(1,2,3-cd)pyrene	193-39-5	UG/L	c	0.034	-	0.034	0.48	-	0.48	1							0.48									
Isophorone	78-59-1	UG/L	c	78	-	78	0	-	0	0																
Naphthalene	91-20-3	UG/L	c	0.17	-	0.17	0	-	0	0																
Nitrobenzene	98-95-3	UG/L	c	0.14	-	0.14	0	-	0	0																
N-Nitroso-di-n-propylamine	621-64-7	UG/L	c	0.011	-	0.011	0	-	0	0																
N-Nitrosodiphenylamine	86-30-6	UG/L	c	12	-	12	3.1	-	3.1	1							3.1	J								
Pentachlorophenol	87-86-5	UG/L	c	0.041	1	0.041	0	-	0	0																
Phenanthrene	85-01-8	UG/L	-	-	-	-	0.09	-	8.6	8							8.6		0.3							
Phenol	108-95-2	UG/L	n	580	-	580	0	-	0	0																
Pyrene	129-00-0	UG/L	n	12	-	12	0.21	-	5.2	3							5.2		0.51							

Table 4-3a

Semivolatile Organic Compounds (SVOCs) Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW20S		MW34D		MW34S		MW36		MW37	
											03/05/14		03/14/14		03/14/14		03/19/14		03/19/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1'-Biphenyl	92-52-4	UG/L	n	0.083	-	0.083	0	-	0	0										
1,2,4,5-Tetrachlorobenzene	95-94-3	UG/L	n	0.17	-	0.17	0	-	0	0										
1,4-Dioxane	123-91-1	UG/L	c	0.46	-	0.46	2.3	-	110	19	12		6.5				13		90	
2,2'-Oxybis(1-chloropropane)	108-60-1	UG/L	n	71	-	71	0	-	0	0										
2,3,4,6-Tetrachlorophenol	58-90-2	UG/L	n	24	-	24	0	-	0	0										
2,4,5-Trichlorophenol	95-95-4	UG/L	n	120	-	120	0	-	0	0										
2,4,6-Trichlorophenol	88-06-2	UG/L	n	1.2	-	1.2	0	-	0	0										
2,4-Dichlorophenol	120-83-2	UG/L	n	4.6	-	4.6	0	-	0	0										
2,4-Dimethylphenol	105-67-9	UG/L	n	36	-	36	0	-	0	0										
2,4-Dinitrophenol	51-28-5	UG/L	n	3.9	-	3.9	0	-	0	0										
2,4-Dinitrotoluene	121-14-2	UG/L	c	0.24	-	0.24	0	-	0	0										
2,6-Dinitrotoluene	606-20-2	UG/L	c	0.049	-	0.049	0	-	0	0										
2-Chloronaphthalene	91-58-7	UG/L	n	75	-	75	0	-	0	0										
2-Chlorophenol	95-57-8	UG/L	n	9.1	-	9.1	0	-	0	0										
2-Methylnaphthalene	91-57-6	UG/L	n	3.6	-	3.6	0.097	-	1.3	5									0.13	
2-Methylphenol	95-48-7	UG/L	n	93	-	93	0	-	0	0										
2-Nitroaniline	88-74-4	UG/L	n	19	-	19	0	-	0	0										
2-Nitrophenol	88-75-5	UG/L	-	-	-	-	0	-	0	0										
3,3'-Dichlorobenzidine	91-94-1	UG/L	c	0.13	-	0.13	0	-	0	0										
3-Nitroaniline	99-09-2	UG/L	-	-	-	-	0	-	0	0										
4,6-Dinitro-2-methylphenol	534-52-1	UG/L	n	0.15	-	0.15	0	-	0	0										
4-Bromophenyl-phenylether	101-55-3	UG/L	-	-	-	-	0	-	0	0										
4-Chloro-3-methylphenol	59-50-7	UG/L	n	140	-	140	0	-	0	0										
4-Chloroaniline	106-47-8	UG/L	c	0.37	-	0.37	0	-	0	0										
4-Chlorophenyl-phenylether	7005-72-3	UG/L	-	-	-	-	0	-	0	0										
4-Methylphenol	106-44-5	UG/L	n	190	-	190	0	-	0	0										
4-Nitroaniline	100-01-6	UG/L	c	3.8	-	3.8	0	-	0	0										
4-Nitrophenol	100-02-7	UG/L	-	-	-	-	0	-	0	0										
Acenaphthene	83-32-9	UG/L	n	53	-	53	0.86	-	4.3	7					0.86					
Acenaphthylene	208-96-8	UG/L	-	-	-	-	0	-	0	0										
Acetophenone	98-86-2	UG/L	n	190	-	190	4.2	-	4.2	1										
Anthracene	120-12-7	UG/L	n	180	-	180	0.09	-	0.88	4					0.09	J				
Atrazine	1912-24-9	UG/L	c	0.3	3	0.3	0	-	0	0										
Benzaldehyde	100-52-7	UG/L	n	190	-	190	0	-	0	0										
Benzo(a)anthracene	56-55-3	UG/L	c	0.012	-	0.012	0	-	0	0										
Benzo(a)pyrene	50-32-8	UG/L	c	0.0034	0.2	0.0034	0.83	-	0.83	1										
Benzo(b)fluoranthene	205-99-2	UG/L	c	0.034	-	0.034	0	-	0	0										
Benzo(g,h,i)perylene	191-24-2	UG/L	-	-	-	-	0.57	-	0.57	1										
Benzo(k)fluoranthene	207-08-9	UG/L	c	0.34	-	0.34	0.53	-	0.53	1										

Semivolatile Organic Compounds (SVOCs) Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW20S		MW34D		MW34S		MW36		MW37	
											03/05/14		03/14/14		03/14/14		03/19/14		03/19/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Bis(2-chloroethoxy)methane	111-91-1	UG/L	n	5.9	-	5.9	0	-	0	0										
Bis(2-chloroethyl)ether	111-44-4	UG/L	c	0.014	-	0.014	0	-	0	0										
Bis(2-ethylhexyl)phthalate	117-81-7	UG/L	c	5.6	6	5.6	2.4	-	48	6										
Butylbenzylphthalate	85-68-7	UG/L	c	16	-	16	0	-	0	0										
Caprolactam	105-60-2	UG/L	n	990	-	990	0	-	0	0										
Carbazole	86-74-8	UG/L	-	-	-	-	0	-	0	0										
Chrysene	218-01-9	UG/L	c	3.4	-	3.4	0	-	0	0										
Dibenzo(a,h)anthracene	53-70-3	UG/L	c	0.0034	-	0.0034	0	-	0	0										
Dibenzofuran	132-64-9	UG/L	n	0.79	-	0.79	0	-	0	0										
Diethylphthalate	84-66-2	UG/L	n	1500	-	1500	3.2	-	4	2										
Dimethylphthalate	131-11-3	UG/L	-	-	-	-	0	-	0	0										
Di-n-butylphthalate	84-74-2	UG/L	n	90	-	90	0	-	0	0										
Di-n-octylphthalate	117-84-0	UG/L	n	20	-	20	0	-	0	0										
Fluoranthene	206-44-0	UG/L	n	80	-	80	0.091	-	6.8	4					0.091	J				
Fluorene	86-73-7	UG/L	n	29	-	29	0.16	-	3.7	7									0.5	
Hexachlorobenzene	118-74-1	UG/L	c	0.0098	1	0.0098	0	-	0	0										
Hexachlorobutadiene	87-68-3	UG/L	c	0.14	-	0.14	0	-	0	0										
Hexachlorocyclopentadiene	77-47-4	UG/L	n	0.041	50	0.041	0	-	0	0										
Hexachloroethane	67-72-1	UG/L	c	0.33	-	0.33	0	-	0	0										
Indeno(1,2,3-cd)pyrene	193-39-5	UG/L	c	0.034	-	0.034	0.48	-	0.48	1										
Isophorone	78-59-1	UG/L	c	78	-	78	0	-	0	0										
Naphthalene	91-20-3	UG/L	c	0.17	-	0.17	0	-	0	0										
Nitrobenzene	98-95-3	UG/L	c	0.14	-	0.14	0	-	0	0										
N-Nitroso-di-n-propylamine	621-64-7	UG/L	c	0.011	-	0.011	0	-	0	0										
N-Nitrosodiphenylamine	86-30-6	UG/L	c	12	-	12	3.1	-	3.1	1										
Pentachlorophenol	87-86-5	UG/L	c	0.041	1	0.041	0	-	0	0										
Phenanthrene	85-01-8	UG/L	-	-	-	-	0.09	-	8.6	8					0.29				0.16	
Phenol	108-95-2	UG/L	n	580	-	580	0	-	0	0										
Pyrene	129-00-0	UG/L	n	12	-	12	0.21	-	5.2	3										

Table 4-3b

1,4 Dioxane and Polycyclic Aromatic Hydrocarbons (PAHs) Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D	
											Result		Result		Result		Result		Result		Result		Result		Result		Result	
1,4-Dioxane	123-91-1	ug/L	c	0.46	-	0.46	1.7	-	220	20	220	J	1.7	J	43	J	27		16		86		21		92		6.4	
2-Methylnaphthalene	91-57-6	ug/L	n	3.6	-	3.6	0.011	-	0.6	14			0.022	J	0.061	J	0.015	J	0.032	J			0.47		0.093	J		
Acenaphthene	83-32-9	ug/L	n	53	-	53	0.006	-	12	14			1.7	J	0.95	J	0.03	J	1.6				3.1		1.6		0.043	J
Acenaphthylene	208-96-8	ug/L	-	-	-	-	0.009	-	0.34	17	0.062	J	0.038	J	0.082	J	0.035	J	0.15		0.2		0.11		0.34		0.15	
Anthracene	120-12-7	ug/L	n	180	-	180	0.048	-	1.1	13	0.41	J	0.064	J	0.22	J	0.11				0.36		0.52		0.64	J		
Benzo(a)anthracene	56-55-3	ug/L	c	0.012	-	0.012	0.015	-	0.23	8			0.042	J	0.033	J			0.015	J			0.056	J	0.041	J	0.043	J
Benzo(a)pyrene	50-32-8	ug/L	c	0.0034	0.2	0.0034	0.022	-	0.12	2			0.022	J														
Benzo(b)fluoranthene	205-99-2	ug/L	c	0.034	-	0.034	0.006	-	0.17	4			0.036	J														
Benzo(g,h,i)perylene	191-24-2	ug/L	-	-	-	-	0.006	-	0.044	3			0.014	J														
Benzo(k)fluoranthene	207-08-9	ug/L	c	0.34	-	0.34	0.006	-	0.089	4			0.01	J														
Chrysene	218-01-9	ug/L	c	3.4	-	3.4	0.006	-	0.21	4			0.036	J					0.0061	J			0.014	J				
Dibenzo(a,h)anthracene	53-70-3	ug/L	c	0.0034	-	0.0034	0.024	-	0.024	1																		
Fluoranthene	206-44-0	ug/L	n	80	-	80	0.007	-	1.3	15	0.012	J	0.24	J	0.011	J			0.061	J			0.34		0.066	J	0.018	J
Fluorene	86-73-7	ug/L	n	29	-	29	0.13	-	5.1	11			0.52	J	0.2	J			0.98				2.4		0.74			
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	c	0.034	-	0.034	0.013	-	0.028	2			0.013	J														
Naphthalene	91-20-3	ug/L	c	0.17	-	0.17	0.019	-	0.47	10			0.024	J							0.028	J	0.083	J				
Pentachlorophenol	87-86-5	ug/L	c	0.041	1	0.041	0	-	0	0	NA		NA		NA		NA		NA				NA		NA		NA	
Phenanthrene	85-01-8	ug/L	-	-	-	-	0.006	-	3.3	12			0.22	J					0.92				3.2		0.2	J		
Pyrene	129-00-0	ug/L	n	12	-	12	0.019	-	0.66	6													0.29					

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-3b

1,4 Dioxane and Polycyclic Aromatic Hydrocarbons (PAHs) Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW07S		MW09		MW11		MW12		MW20D		MW20D-DUP		MW20I		MW20S		MW34D	
									Result		Result		Result		Result		Result		Result		Result		Result		Result	
1,4-Dioxane	123-91-1	ug/L	c	0.46	-	0.46	1.7 - 220	20	7.8				140		160		33		31		6		39		12	
2-Methylnaphthalene	91-57-6	ug/L	n	3.6	-	3.6	0.011 - 0.6	14	0.023	J			0.6		0.36	J	0.011	J					0.15			
Acenaphthene	83-32-9	ug/L	n	53	-	53	0.006 - 12	14	0.19				2.4		4.2	J			0.0055	J						
Acenaphthylene	208-96-8	ug/L	-	-	-	-	0.009 - 0.34	17	0.055	J			0.16		0.31	J					0.0085	J	0.021	J		
Anthracene	120-12-7	ug/L	n	180	-	180	0.048 - 1.1	13					1		1	J							0.048	J		
Benzo(a)anthracene	56-55-3	ug/L	c	0.012	-	0.012	0.015 - 0.23	8					0.23													
Benzo(a)pyrene	50-32-8	ug/L	c	0.0034	0.2	0.0034	0.022 - 0.12	2					0.12	J												
Benzo(b)fluoranthene	205-99-2	ug/L	c	0.034	-	0.034	0.006 - 0.17	4					0.17	J							0.0085	J	0.0064	J		
Benzo(g,h,i)perylene	191-24-2	ug/L	-	-	-	-	0.006 - 0.044	3									0.0057	J			0.044	J				
Benzo(k)fluoranthene	207-08-9	ug/L	c	0.34	-	0.34	0.006 - 0.089	4					0.089	J							0.0062	J	0.0056	J		
Chrysene	218-01-9	ug/L	c	3.4	-	3.4	0.006 - 0.21	4					0.21													
Dibenzo(a,h)anthracene	53-70-3	ug/L	c	0.0034	-	0.0034	0.024 - 0.024	1													0.024	J				
Fluoranthene	206-44-0	ug/L	n	80	-	80	0.007 - 1.3	15	0.021	J			1.3		0.69	J			0.011	J	0.0066	J	0.011	J		
Fluorene	86-73-7	ug/L	n	29	-	29	0.13 - 5.1	11	0.35				2		2.8	J										
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	c	0.034	-	0.034	0.013 - 0.028	2													0.028	J				
Naphthalene	91-20-3	ug/L	c	0.17	-	0.17	0.019 - 0.47	10					0.36		0.2	J			0.02	J			0.47			
Pentachlorophenol	87-86-5	ug/L	c	0.041	1	0.041	0 - 0	0	NA		NA				NA		NA				NA		NA		NA	
Phenanthrene	85-01-8	ug/L	-	-	-	-	0.006 - 3.3	12	0.017	J			3.3		1.2	J			0.013	J	0.0064	J	0.016	J		
Pyrene	129-00-0	ug/L	n	12	-	12	0.019 - 0.66	6					0.66		0.46	J										

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is le

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatec

Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-3b

1,4 Dioxane and Polycyclic Aromatic Hydrocarbons (PAHs) Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW34S		MW36		MW37	
											Result		Result		Result	
1,4-Dioxane	123-91-1	ug/L	c	0.46	-	0.46	1.7	-	220	20	10		40		110	
2-Methylnaphthalene	91-57-6	ug/L	n	3.6	-	3.6	0.011	-	0.6	14	0.047	J	0.025	J	0.14	
Acenaphthene	83-32-9	ug/L	n	53	-	53	0.006	-	12	14	0.95	J	0.49		12	J
Acenaphthylene	208-96-8	ug/L	-	-	-	-	0.009	-	0.34	17	0.039	J	0.08	J	0.16	
Anthracene	120-12-7	ug/L	n	180	-	180	0.048	-	1.1	13	0.19	J	0.24		1.1	
Benzo(a)anthracene	56-55-3	ug/L	c	0.012	-	0.012	0.015	-	0.23	8					0.092	J
Benzo(a)pyrene	50-32-8	ug/L	c	0.0034	0.2	0.0034	0.022	-	0.12	2						
Benzo(b)fluoranthene	205-99-2	ug/L	c	0.034	-	0.034	0.006	-	0.17	4						
Benzo(g,h,i)perylene	191-24-2	ug/L	-	-	-	-	0.006	-	0.044	3						
Benzo(k)fluoranthene	207-08-9	ug/L	c	0.34	-	0.34	0.006	-	0.089	4						
Chrysene	218-01-9	ug/L	c	3.4	-	3.4	0.006	-	0.21	4						
Dibenzo(a,h)anthracene	53-70-3	ug/L	c	0.0034	-	0.0034	0.024	-	0.024	1						
Fluoranthene	206-44-0	ug/L	n	80	-	80	0.007	-	1.3	15	0.11	J			0.3	
Fluorene	86-73-7	ug/L	n	29	-	29	0.13	-	5.1	11	0.69	J	0.13		5.1	
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	c	0.034	-	0.034	0.013	-	0.028	2						
Naphthalene	91-20-3	ug/L	c	0.17	-	0.17	0.019	-	0.47	10	0.078	J	0.019	J	0.094	J
Pentachlorophenol	87-86-5	ug/L	c	0.041	1	0.041	0	-	0	0	NA					
Phenanthrene	85-01-8	ug/L	-	-	-	-	0.006	-	3.3	12	0.32	J			1.6	
Pyrene	129-00-0	ug/L	n	12	-	12	0.019	-	0.66	6	0.058	J	0.019	J	0.22	

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is le

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatec

Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-3c

Semivolatile Organic Compounds (SVOCs) Detected in Landfill Area Groundwater (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S		MW11	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
1,1'-Biphenyl	92-52-4	n	0.083	-	0.083	UG/L	0	-	0	0																						
1,2,4,5-Tetrachlorobenzene	95-94-3	n	0.17	-	0.17	UG/L	0	-	0	0																						
1,4-Dioxane	123-91-1	c	0.46	-	0.46	UG/L	1.3	-	150	19	100		2.9		27		23		24		27		30		77		6.3		18		150	
2,2'-oxybis(1-chloropropane)	108-60-1	n	71	-	71	UG/L	0	-	0	0																						
2,3,4,6-Tetrachlorophenol	58-90-2	n	24	-	24	UG/L	0	-	0	0																						
2,4,5-Trichlorophenol	95-95-4	n	120	-	120	UG/L	0	-	0	0																						
2,4,6-Trichlorophenol	88-06-2	n	1.2	-	1.2	UG/L	0	-	0	0																						
2,4-Dichlorophenol	120-83-2	n	4.6	-	4.6	UG/L	0	-	0	0																						
2,4-Dimethylphenol	105-67-9	n	36	-	36	UG/L	0	-	0	0																						
2,4-Dinitrophenol	51-28-5	n	3.9	-	3.9	UG/L	0	-	0	0																						
2,4-Dinitrotoluene	121-14-2	c	0.24	-	0.24	UG/L	0	-	0	0																						
2,6-Dinitrotoluene	606-20-2	c	0.049	-	0.049	UG/L	0	-	0	0																						
2-Chloronaphthalene	91-58-7	n	75	-	75	UG/L	0	-	0	0																						
2-Chlorophenol	95-57-8	n	9.1	-	9.1	UG/L	0	-	0	0																						
2-Methylnaphthalene	91-57-6	n	3.6	-	3.6	UG/L	0.51	-	2.5	2			2.5	J			NA				NA		NA		NA						0.51	J
2-Methylphenol	95-48-7	n	93	-	93	UG/L	0	-	0	0																						
2-Nitroaniline	88-74-4	n	19	-	19	UG/L	0	-	0	0																						
2-Nitrophenol	88-75-5	-	-	-	-	UG/L	0	-	0	0																						
3,3'-Dichlorobenzidine	91-94-1	c	0.13	-	0.13	UG/L	0	-	0	0																						
3-Nitroaniline	99-09-2	-	-	-	-	UG/L	0	-	0	0																						
4,6-Dinitro-2-methylphenol	534-52-1	n	0.15	-	0.15	UG/L	0	-	0	0																						
4-Bromophenyl-phenylether	101-55-3	-	-	-	-	UG/L	0	-	0	0																						
4-Chloro-3-methylphenol	59-50-7	n	140	-	140	UG/L	0	-	0	0																						
4-Chloroaniline	106-47-8	c	0.37	-	0.37	UG/L	0	-	0	0																						
4-Chlorophenyl-phenylether	7005-72-3	-	-	-	-	UG/L	0	-	0	0																						
4-Methylphenol	106-44-5	n	190	-	190	UG/L	0	-	0	0																						
4-Nitroaniline	100-01-6	c	3.8	-	3.8	UG/L	0	-	0	0																						
4-Nitrophenol	100-02-7	-	-	-	-	UG/L	0	-	0	0																						
Acenaphthene	83-32-9	n	53	-	53	UG/L	0.55	-	15	6			7.6		1.2	J	NA		2.3	J	NA		NA		NA						2.8	J
Acenaphthylene	208-96-8	-	-	-	-	UG/L	0	-	0	0							NA				NA		NA		NA							
Acetophenone	98-86-2	n	190	-	190	UG/L	0	-	0	0																						
Anthracene	120-12-7	n	180	-	180	UG/L	0.66	-	2.8	5			2.8	J			NA				NA		NA		NA				0.72	J	1.6	J
Atrazine	1912-24-9	c	0.3	3	0.3	UG/L	0	-	0	0																						

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-3c

Semivolatile Organic Compounds (SVOCs) Detected in Landfill Area Groundwater (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S		MW11	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Benzaldehyde	100-52-7	n	190	-	190	UG/L	1.1	-	1.2	2																			1.1	J		
Benzo(a)anthracene	56-55-3	c	0.012	-	0.012	UG/L	0.79	-	2.3	2			2.3	J			NA						NA								0.79	J
Benzo(a)pyrene	50-32-8	c	0.0034	0.2	0.0034	UG/L	0	-	0	0							NA				NA		NA		NA							
Benzo(b)fluoranthene	205-99-2	c	0.034	-	0.034	UG/L	1.4	-	1.4	1			1.4	J			NA				NA		NA		NA							
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	UG/L	0	-	0	0							NA				NA		NA		NA							
Benzo(k)fluoranthene	207-08-9	c	0.34	-	0.34	UG/L	0	-	0	0							NA				NA		NA		NA							
Bis(2-Chloroethoxy)methane	111-91-1	n	5.9	-	5.9	UG/L	0	-	0	0																						
Bis(2-Chloroethyl)ether	111-44-4	c	0.014	-	0.014	UG/L	0	-	0	0																						
bis(2-ethylhexyl)phthalate	117-81-7	c	5.6	6	5.6	UG/L	0.63	-	26	7									1.4	J											26	J
Butylbenzylphthalate	85-68-7	c	16	-	16	UG/L	0.56	-	3.5	6									0.71	J												
Caprolactam	105-60-2	n	990	-	990	UG/L	0	-	0	0																						
Carbazole	86-74-8	-	-	-	-	UG/L	0	-	0	0																						
Chrysene	218-01-9	c	3.4	-	3.4	UG/L	0.72	-	2.1	2			2.1	J			NA				NA		NA		NA						0.72	J
Dibenzo(a,h)anthracene	53-70-3	c	0.0034	-	0.0034	UG/L	0	-	0	0							NA				NA		NA		NA							
Dibenzofuran	132-64-9	n	0.79	-	0.79	UG/L	4.2	-	7.4	2			4.2	J																		
Diethylphthalate	84-66-2	n	1500	-	1500	UG/L	0	-	0	0																						
Dimethylphthalate	131-11-3	-	-	-	-	UG/L	0	-	0	0																						
Di-n-butylphthalate	84-74-2	n	90	-	90	UG/L	0	-	0	0																						
Di-n-octylphthalate	117-84-0	n	20	-	20	UG/L	0	-	0	0																						
Fluoranthene	206-44-0	n	80	-	80	UG/L	1.1	-	12	4			12	J	2.3	J	NA				NA		NA		NA						2.2	J
Fluorene	86-73-7	n	29	-	29	UG/L	0.68	-	6.8	5			6.8				NA		1.5	J	NA		NA		NA						2.2	J
Hexachlorobenzene	118-74-1	c	0.0098	1	0.0098	UG/L	0	-	0	0																						
Hexachlorobutadiene	87-68-3	c	0.14	-	0.14	UG/L	0	-	0	0																						
Hexachlorocyclopentadiene	77-47-4	n	0.041	50	0.041	UG/L	0	-	0	0																						
Hexachloroethane	67-72-1	c	0.33	-	0.33	UG/L	0	-	0	0																						
Indeno(1,2,3-cd)pyrene	193-39-5	c	0.034	-	0.034	UG/L	0	-	0	0							NA				NA		NA		NA							
Isophorone	78-59-1	c	78	-	78	UG/L	0	-	0	0																						
Naphthalene	91-20-3	c	0.17	-	0.17	UG/L	0.48	-	3	2			3	J			NA				NA		NA		NA							
Nitrobenzene	98-95-3	c	0.14	-	0.14	UG/L	0	-	0	0																						
N-Nitroso-di-n-propylamine	621-64-7	c	0.011	-	0.011	UG/L	0	-	0	0																						
N-Nitrosodiphenylamine	86-30-6	c	12	-	12	UG/L	0.68	-	1.6	2																					1.6	J
Pentachlorophenol	87-86-5	c	0.041	1	0.041	UG/L	0	-	0	0							NA				NA		NA		NA							
Phenanthrene	85-01-8	-	-	-	-	UG/L	0.7	-	22	6			22	J	3.3	J	NA		0.7	J	NA		NA		NA						5.1	
Phenol	108-95-2	n	580	-	580	UG/L	0	-	0	0																						
Pyrene	129-00-0	n	12	-	12	UG/L	0.89	-	7.1	4			7.1		1.5	J	NA				NA		NA		NA						2.3	J

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-3c

Semivolatile Organic Compounds (SVOCs) Detected in Landfill Area Groundwater (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	MW12		MW20D		MW20I		MW20S		MW34D		MW34S		MW36		MW37	
							Result		Result		Result		Result		Result		Result		Result		Result	
1,1'-Biphenyl	92-52-4	n	0.083	-	0.083	UG/L									NA		NA					
1,2,4,5-Tetrachlorobenzene	95-94-3	n	0.17	-	0.17	UG/L									NA		NA					
1,4-Dioxane	123-91-1	c	0.46	-	0.46	UG/L	150		25		1.3		7.4		10		4.6		22		140	
2,2'-oxybis(1-chloropropane)	108-60-1	n	71	-	71	UG/L									NA		NA					
2,3,4,6-Tetrachlorophenol	58-90-2	n	24	-	24	UG/L									NA		NA					
2,4,5-Trichlorophenol	95-95-4	n	120	-	120	UG/L									NA		NA					
2,4,6-Trichlorophenol	88-06-2	n	1.2	-	1.2	UG/L									NA		NA					
2,4-Dichlorophenol	120-83-2	n	4.6	-	4.6	UG/L									NA		NA					
2,4-Dimethylphenol	105-67-9	n	36	-	36	UG/L									NA		NA					
2,4-Dinitrophenol	51-28-5	n	3.9	-	3.9	UG/L									NA		NA					
2,4-Dinitrotoluene	121-14-2	c	0.24	-	0.24	UG/L									NA		NA					
2,6-Dinitrotoluene	606-20-2	c	0.049	-	0.049	UG/L									NA		NA					
2-Chloronaphthalene	91-58-7	n	75	-	75	UG/L									NA		NA					
2-Chlorophenol	95-57-8	n	9.1	-	9.1	UG/L									NA		NA					
2-Methylnaphthalene	91-57-6	n	3.6	-	3.6	UG/L	NA								NA		NA					
2-Methylphenol	95-48-7	n	93	-	93	UG/L									NA		NA					
2-Nitroaniline	88-74-4	n	19	-	19	UG/L									NA		NA					
2-Nitrophenol	88-75-5	-	-	-	-	UG/L									NA		NA					
3,3'-Dichlorobenzidine	91-94-1	c	0.13	-	0.13	UG/L									NA		NA					
3-Nitroaniline	99-09-2	-	-	-	-	UG/L									NA		NA					
4,6-Dinitro-2-methylphenol	534-52-1	n	0.15	-	0.15	UG/L									NA		NA					
4-Bromophenyl-phenylether	101-55-3	-	-	-	-	UG/L									NA		NA					
4-Chloro-3-methylphenol	59-50-7	n	140	-	140	UG/L									NA		NA					
4-Chloroaniline	106-47-8	c	0.37	-	0.37	UG/L									NA		NA					
4-Chlorophenyl-phenylether	7005-72-3	-	-	-	-	UG/L									NA		NA					
4-Methylphenol	106-44-5	n	190	-	190	UG/L									NA		NA					
4-Nitroaniline	100-01-6	c	3.8	-	3.8	UG/L									NA		NA					
4-Nitrophenol	100-02-7	-	-	-	-	UG/L									NA		NA					
Acenaphthene	83-32-9	n	53	-	53	UG/L	NA				0.55	J			NA		NA				15	
Acenaphthylene	208-96-8	-	-	-	-	UG/L	NA								NA		NA					
Acetophenone	98-86-2	n	190	-	190	UG/L									NA		NA					
Anthracene	120-12-7	n	180	-	180	UG/L	NA								NA		NA		0.88	J	0.66	J
Atrazine	1912-24-9	c	0.3	3	0.3	UG/L									NA		NA					

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-3c
Semivolatile Organic Compounds (SVOCs) Detected in Landfill Area Groundwater (July 2015)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	MW12		MW20D		MW20I		MW20S		MW34D		MW34S		MW36		MW37	
							Result		Result		Result		Result		Result		Result		Result		Result	
Benzaldehyde	100-52-7	n	190	-	190	UG/L									NA		NA		1.2	J		
Benzo(a)anthracene	56-55-3	c	0.012	-	0.012	UG/L	NA								NA		NA					
Benzo(a)pyrene	50-32-8	c	0.0034	0.2	0.0034	UG/L	NA								NA		NA					
Benzo(b)fluoranthene	205-99-2	c	0.034	-	0.034	UG/L	NA								NA		NA					
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	UG/L	NA								NA		NA					
Benzo(k)fluoranthene	207-08-9	c	0.34	-	0.34	UG/L	NA								NA		NA					
Bis(2-Chloroethoxy)methane	111-91-1	n	5.9	-	5.9	UG/L									NA		NA					
Bis(2-Chloroethyl)ether	111-44-4	c	0.014	-	0.014	UG/L									NA		NA					
bis(2-ethylhexyl)phthalate	117-81-7	c	5.6	6	5.6	UG/L			1.4	J	1.5	J	1.2	J	NA		NA		0.63	J	0.75	J
Butylbenzylphthalate	85-68-7	c	16	-	16	UG/L			2.2	J	3.5	J	2.3	J	NA		NA		0.57	J	0.56	J
Caprolactam	105-60-2	n	990	-	990	UG/L									NA		NA					
Carbazole	86-74-8	-	-	-	-	UG/L									NA		NA					
Chrysene	218-01-9	c	3.4	-	3.4	UG/L	NA								NA		NA					
Dibenzo(a,h)anthracene	53-70-3	c	0.0034	-	0.0034	UG/L	NA								NA		NA					
Dibenzofuran	132-64-9	n	0.79	-	0.79	UG/L									NA		NA				7.4	J
Diethylphthalate	84-66-2	n	1500	-	1500	UG/L									NA		NA					
Dimethylphthalate	131-11-3	-	-	-	-	UG/L									NA		NA					
Di-n-butylphthalate	84-74-2	n	90	-	90	UG/L									NA		NA					
Di-n-octylphthalate	117-84-0	n	20	-	20	UG/L									NA		NA					
Fluoranthene	206-44-0	n	80	-	80	UG/L	NA				1.1	J			NA		NA					
Fluorene	86-73-7	n	29	-	29	UG/L	NA				0.68	J			NA		NA				6	
Hexachlorobenzene	118-74-1	c	0.0098	1	0.0098	UG/L									NA		NA					
Hexachlorobutadiene	87-68-3	c	0.14	-	0.14	UG/L									NA		NA					
Hexachlorocyclopentadiene	77-47-4	n	0.041	50	0.041	UG/L									NA		NA					
Hexachloroethane	67-72-1	c	0.33	-	0.33	UG/L									NA		NA					
Indeno(1,2,3-cd)pyrene	193-39-5	c	0.034	-	0.034	UG/L	NA								NA		NA					
Isophorone	78-59-1	c	78	-	78	UG/L									NA		NA					
Naphthalene	91-20-3	c	0.17	-	0.17	UG/L	NA						0.48	J	NA		NA					
Nitrobenzene	98-95-3	c	0.14	-	0.14	UG/L									NA		NA					
N-Nitroso-di-n-propylamine	621-64-7	c	0.011	-	0.011	UG/L									NA		NA					
N-Nitrosodiphenylamine	86-30-6	c	12	-	12	UG/L									NA		NA		0.68	J		
Pentachlorophenol	87-86-5	c	0.041	1	0.041	UG/L	NA								NA		NA					
Phenanthrene	85-01-8	-	-	-	-	UG/L	NA				2.4	J			NA		NA				2.4	J
Phenol	108-95-2	n	580	-	580	UG/L									NA		NA					
Pyrene	129-00-0	n	12	-	12	UG/L	NA				0.89	J			NA		NA					

* USEPA Region III Regional Screening Level (RSL), November 2015
** Pennsylvania Maximum Contaminant Levels
Highlighted concentrations are over Project Screening Levels

Table 4-3d

Polycyclic Aromatic Hydrocarbons (PAHs) Detected in Landfill Area Groundwater (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S		MW11	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
2-Methylnaphthalene	91-57-6	n	3.6	-	3.6	UG/L	0.16	-	0.59	4													0.59		0.22		0.16					
Acenaphthene	83-32-9	n	53	-	53	UG/L	0.23	-	11	10			1.9		0.95	J			1.2				3.1		3.1						0.85	
Acenaphthylene	208-96-8	-	-	-	-	UG/L	0.12	-	0.38	3																	0.12				0.32	
Anthracene	120-12-7	n	180	-	180	UG/L	0.068	-	1.2	15			0.08	J	0.068	J	0.14		0.24		0.59		0.44		0.22		0.57		0.71		1.2	
Benzo(a)anthracene	56-55-3	c	0.012	-	0.012	UG/L	0.084	-	1.1	5			0.086	J															0.096	J	1.1	
Benzo(a)pyrene	50-32-8	c	0.0034	0.2	0.0034	UG/L	0.42	-	0.42	1																					0.42	
Benzo(b)fluoranthene	205-99-2	c	0.034	-	0.034	UG/L	0.12	-	0.52	2																					0.52	
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	UG/L	0.19	-	0.19	1																					0.19	
Benzo(k)fluoranthene	207-08-9	c	0.34	-	0.34	UG/L	0.041	-	0.29	2																					0.29	
Chrysene	218-01-9	c	3.4	-	3.4	UG/L	0.11	-	0.73	3			0.11																		0.73	
Dibenzo(a,h)anthracene	53-70-3	c	0.0034	-	0.0034	UG/L	0.061	-	0.061	1																					0.061	J
Fluoranthene	206-44-0	n	80	-	80	UG/L	0.09	-	2.3	9			0.26						0.09	J			0.46		0.14				0.21		2.3	
Fluorene	86-73-7	n	29	-	29	UG/L	0.098	-	6.6	11			0.72		0.24				0.95				2.4		1.1				0.098	J-	0.92	
Indeno(1,2,3-cd)pyrene	193-39-5	c	0.034	-	0.034	UG/L	0.17	-	0.17	1																					0.17	
Naphthalene	91-20-3	c	0.17	-	0.17	UG/L	0.062	-	0.4	9									0.34				0.096	J	0.14		0.17				0.38	
Pentachlorophenol	87-86-5	c	0.041	1	0.041	UG/L	0.11	-	0.61	6	0.13	J	0.11	J	0.11	J											0.61		0.19	J		
Phenanthrene	85-01-8	-	-	-	-	UG/L	0.07	-	4.1	10			0.34		0.07	J			0.49				3.1		0.49				0.28		4.1	
Pyrene	129-00-0	n	12	-	12	UG/L	0.087	-	1.7	10			0.26						0.087	J			0.35		0.18				0.17		1.7	

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-3d
Polycyclic Aromatic Hydrocarbons (PAHs) Detected in Landfill Area Groundwater (July 2015)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW12		MW20D		MW20I		MW20S		MW36		MW37	
											Result		Result		Result		Result		Result		Result	
2-Methylnaphthalene	91-57-6	n	3.6	-	3.6	UG/L	0.16	-	0.59	4	0.28											
Acenaphthene	83-32-9	n	53	-	53	UG/L	0.23	-	11	10	4.8				0.41	J			0.23		11	
Acenaphthylene	208-96-8	-	-	-	-	UG/L	0.12	-	0.38	3											0.38	
Anthracene	120-12-7	n	180	-	180	UG/L	0.068	-	1.2	15	0.81				0.29		0.16		0.97		0.44	
Benzo(a)anthracene	56-55-3	c	0.012	-	0.012	UG/L	0.084	-	1.1	5	0.084	J			0.29							
Benzo(a)pyrene	50-32-8	c	0.0034	0.2	0.0034	UG/L	0.42	-	0.42	1												
Benzo(b)fluoranthene	205-99-2	c	0.034	-	0.034	UG/L	0.12	-	0.52	2					0.12							
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	UG/L	0.19	-	0.19	1												
Benzo(k)fluoranthene	207-08-9	c	0.34	-	0.34	UG/L	0.041	-	0.29	2					0.041	J						
Chrysene	218-01-9	c	3.4	-	3.4	UG/L	0.11	-	0.73	3					0.17							
Dibenzo(a,h)anthracene	53-70-3	c	0.0034	-	0.0034	UG/L	0.061	-	0.061	1												
Fluoranthene	206-44-0	n	80	-	80	UG/L	0.09	-	2.3	9	0.9				1						0.29	
Fluorene	86-73-7	n	29	-	29	UG/L	0.098	-	6.6	11	3.7				0.67	J			0.14		6.6	
Indeno(1,2,3-cd)pyrene	193-39-5	c	0.034	-	0.034	UG/L	0.17	-	0.17	1												
Naphthalene	91-20-3	c	0.17	-	0.17	UG/L	0.062	-	0.4	9	0.21				0.062	J	0.4				0.14	
Pentachlorophenol	87-86-5	c	0.041	1	0.041	UG/L	0.11	-	0.61	6							0.13	J				
Phenanthrene	85-01-8	-	-	-	-	UG/L	0.07	-	4.1	10	2.2				1.9						1.4	
Pyrene	129-00-0	n	12	-	12	UG/L	0.087	-	1.7	10	0.8				0.81				0.097	J	0.24	

* USEPA Region III Regional Screening Level (RSL), November 2015
** Pennsylvania Maximum Contaminant Levels
Highlighted concentrations are over Project Screening Levels

Table 4-4a

Pesticides Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S		MW09	
											03/10/14		03/10/14		03/10/14		03/11/14		03/20/14		03/18/14		03/18/14		03/11/14		03/25/14		03/25/14		03/11/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	UG/L	c	0.032	-	0.032	0	-	0	0																						
4,4'-DDE	72-55-9	UG/L	c	0.046	-	0.046	0	-	0	0																						
4,4'-DDT	50-29-3	UG/L	c	0.23	-	0.23	0.03	-	0.03	1									0.03	J												
Aldrin	309-00-2	UG/L	c	0.00092	-	0.00092	0.039	-	0.047	2																			0.039	J		
alpha-BHC	319-84-6	UG/L	c	0.0072	-	0.0072	0	-	0	0																						
alpha-Chlordane	5103-71-9	UG/L	c	0.045	-	0.045	0.017	-	0.017	1									0.017	J												
beta-BHC	319-85-7	UG/L	c	0.025	-	0.025	0.022	-	0.081	6	0.022	J					0.078	J											0.03	J	0.026	J
delta-BHC	319-86-8	UG/L	-	-	-	-	0.015	-	0.034	2																	0.034	J				
Dieldrin	60-57-1	UG/L	c	0.0018	-	0.0018	0.019	-	0.022	2																			0.022	J		
Endosulfan I	959-98-8	UG/L	n	10	-	10	0	-	0	0																						
Endosulfan II	33213-65-9	UG/L	n	10	-	10	0.025	-	0.025	2									0.025	J							0.025	J				
Endosulfan sulfate	1031-07-8	UG/L	n	10	-	10	0	-	0	0																						
Endrin	72-20-8	UG/L	n	0.23	2	0.23	0.024	-	0.058	3									0.058	J												
Endrin aldehyde	7421-93-4	UG/L	n	0.23	-	0.23	0.039	-	0.039	1									0.039	J												
Endrin ketone	53494-70-5	UG/L	n	0.23	-	0.23	0	-	0	0																						
gamma-BHC (Lindane)	58-89-9	UG/L	c	0.042	0.2	0.042	0.044	-	0.044	1																						
gamma-Chlordane	5103-74-2	UG/L	c	0.045	-	0.045	0.014	-	0.035	2									0.035	J									0.014	J		
Heptachlor	76-44-8	UG/L	c	0.0014	0.4	0.0014	0	-	0	0																						
Heptachlor epoxide	1024-57-3	UG/L	c	0.0014	0.2	0.0014	0	-	0	0																						
Methoxychlor	72-43-5	UG/L	n	3.7	40	3.7	0.079	-	0.079	1																			0.079	J		
Toxaphene	8001-35-2	UG/L	c	0.071	3	0.071	0	-	0	0																						

Table 4-4a

Pesticides Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW11		MW12		MW20D		MW20D-DUP		MW20I		MW20S		MW34D		MW34S		MW36		MW37	
											03/25/14		03/19/14		03/26/14		03/26/14		03/05/14		03/05/14		03/14/14		03/14/14		03/19/14		03/19/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	UG/L	c	0.032	-	0.032	0	-	0	0																				
4,4'-DDE	72-55-9	UG/L	c	0.046	-	0.046	0	-	0	0																				
4,4'-DDT	50-29-3	UG/L	c	0.23	-	0.23	0.03	-	0.03	1																				
Aldrin	309-00-2	UG/L	c	0.00092	-	0.00092	0.039	-	0.047	2			0.047	J																
alpha-BHC	319-84-6	UG/L	c	0.0072	-	0.0072	0	-	0	0																				
alpha-Chlordane	5103-71-9	UG/L	c	0.045	-	0.045	0.017	-	0.017	1																				
beta-BHC	319-85-7	UG/L	c	0.025	-	0.025	0.022	-	0.081	6			0.081	J															0.067	J
delta-BHC	319-86-8	UG/L	-	-	-	-	0.015	-	0.034	2			0.015	J																
Dieldrin	60-57-1	UG/L	c	0.0018	-	0.0018	0.019	-	0.022	2																			0.019	J
Endosulfan I	959-98-8	UG/L	n	10	-	10	0	-	0	0																				
Endosulfan II	33213-65-9	UG/L	n	10	-	10	0.025	-	0.025	2																				
Endosulfan sulfate	1031-07-8	UG/L	n	10	-	10	0	-	0	0																				
Endrin	72-20-8	UG/L	n	0.23	2	0.23	0.024	-	0.058	3											0.048	J							0.024	J
Endrin aldehyde	7421-93-4	UG/L	n	0.23	-	0.23	0.039	-	0.039	1																				
Endrin ketone	53494-70-5	UG/L	n	0.23	-	0.23	0	-	0	0																				
gamma-BHC (Lindane)	58-89-9	UG/L	c	0.042	0.2	0.042	0.044	-	0.044	1			0.044	J																
gamma-Chlordane	5103-74-2	UG/L	c	0.045	-	0.045	0.014	-	0.035	2																				
Heptachlor	76-44-8	UG/L	c	0.0014	0.4	0.0014	0	-	0	0																				
Heptachlor epoxide	1024-57-3	UG/L	c	0.0014	0.2	0.0014	0	-	0	0																				
Methoxychlor	72-43-5	UG/L	n	3.7	40	3.7	0.079	-	0.079	1																				
Toxaphene	8001-35-2	UG/L	c	0.071	3	0.071	0	-	0	0																				

Pesticides Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Delaware and Philadelphia Counties, Pennsylvania

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S		MW09	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
4,4'-DDD	72-54-8	ug/L	c	0.032	-	0.032	0.00025	-	0.01	16			0.01	J	0.0003	J	0.0005	J	0.00045	J			0.0003	J	0.00083	J	0.00025	J	0.0019	J	0.00055	J
4,4'-DDE	72-55-9	ug/L	c	0.046	-	0.046	0.00017	-	0.063	21	0.0012	J	0.0009	J	0.0004	J	0.0005	J	0.00025	J	0.00036	J	0.0029	J	0.0026	J	0.0012	J	0.00069	J	0.00017	J
4,4'-DDT	50-29-3	ug/L	c	0.23	-	0.23	0.00028	-	0.089	6									0.002	J					0.0061	J	0.0037	J	0.0017	J		
Aldrin	309-00-2	ug/L	c	0.00092	-	0.00092	0.00018	-	0.0047	19			0.0002	J	0.0004	J	0.001	J	0.0024	J	0.00065	J	0.0021	J	0.0007	J	0.0022	J	0.00051	J	0.00059	J
alpha-BHC	319-84-6	ug/L	c	0.0072	-	0.0072	0.0001	-	0.0037	21	0.0004	J	0.0001	J	0.0013	J	0.0023	J	0.00031	J	0.00055	J	0.0006	J	0.00038	J	0.00093	J	0.00061	J	0.00066	J
alpha-Chlordane	5103-71-9	ug/L	c	0.045	-	0.045	0.0001	-	0.02	17	0.0007	J	0.0015	J	0.0001	J	0.0041	J	0.02	J			0.0069	J	0.00079	J	0.0005	J	0.00029	J	0.00049	J
beta-BHC	319-85-7	ug/L	c	0.025	-	0.025	0.0007	-	0.012	10	0.0007	J			0.0019	J	0.0007	J	0.0024	J			0.011	J								
delta-BHC	319-86-8	ug/L	-	-	-	-	0.00015	-	0.016	18	0.0003	J	0.0002	J	0.0084		0.0036	J	0.0025	J			0.014	J	0.00033	J	0.00047	J	0.00065	J	0.00042	J
Dieldrin	60-57-1	ug/L	c	0.0018	-	0.0018	0.0001	-	0.053	15			0.0001	J	0.0023	J			0.00039	J			0.0008	J	0.0016	J	0.00042	J	0.0015	J		
Endosulfan I	959-98-8	ug/L	n	10	-	10	0.00017	-	0.005	18	0.0003	J	0.0005	J	0.0003	J	0.0006	J	0.00023	J	0.005	J	0.0013	J	0.0011	J			0.001	J	0.00017	J
Endosulfan II	33213-65-9	ug/L	n	10	-	10	0.00026	-	0.0043	9									0.0027	J					0.0017	J	0.0017	J	0.0032	J		
Endosulfan sulfate	1031-07-8	ug/L	n	10	-	10	0.00017	-	0.0017	12					0.0005	J					0.00038	J	0.001	J			0.00037	J				
Endrin	72-20-8	ug/L	n	0.23	2	0.23	0.00016	-	0.0026	14									0.00026	J	0.00023	J	0.0009	J	0.00019	J	0.00023	J				
Endrin aldehyde	7421-93-4	ug/L	n	0.23	-	0.23	0.00019	-	0.0028	11									0.001	J					0.0012	J	0.0028	J	0.0011	J	0.00019	J
Endrin ketone	53494-70-5	ug/L	n	0.23	-	0.23	0.0001	-	0.021	13					0.0001	J			0.00076	J	0.0022	J	0.0005	J			0.00022	J	0.00019	J		
gamma-BHC (Lindane)	58-89-9	ug/L	c	0.042	0.2	0.042	0.00015	-	0.013	20	0.0002	J	0.0004	J	0.0002	J	0.0005	J	0.0044	J	0.0014	J	0.0019	J	0.0021	J	0.00038	J	0.00078	J	0.00023	J
gamma-Chlordane	5103-74-2	ug/L	c	0.045	-	0.045	0.0002	-	0.014	17	0.0005	J	0.0002	J					0.00037	J	0.00028	J	0.0003	J			0.00021	J	0.00087	J		
Heptachlor	76-44-8	ug/L	c	0.0014	0.4	0.0014	0.00023	-	0.01	19			0.001	J	0.0005	J	0.0008	J	0.0075	J	0.00052	J	0.002	J	0.01	J	0.00079	J	0.00064	J	0.00073	J
Heptachlor epoxide	1024-57-3	ug/L	c	0.0014	0.2	0.0014	0.00018	-	0.0023	13									0.00069	J			0.0003	J	0.0007	J			0.0005	J	0.00028	J
Methoxychlor	72-43-5	ug/L	n	3.7	40	3.7	0.0008	-	0.007	13											0.0049	J	0.0008	J	0.0028	J	0.007	J	0.0025	J		
Toxaphene	8001-35-2	ug/L	c	0.071	3	0.071	0	-	0	0																						

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Pesticides Detected in Landfill Area Groundwater (December 2014)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)
Delaware and Philadelphia Counties, Pennsylvania

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW11		MW12		MW20D		MW20D-DUP		MW20I		MW20S		MW34D		MW34S		MW36		MW37	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
4,4'-DDD	72-54-8	ug/L	c	0.032	-	0.032	0.00025	-	0.01	16	0.00057	J	0.00039	J					0.0024	J	0.0004	J			0.0012	J	0.0021	J	0.0023	J
4,4'-DDE	72-55-9	ug/L	c	0.046	-	0.046	0.00017	-	0.063	21	0.063	J	0.0017	J	0.0002	J	0.00048	J	0.0012	J	0.00043	J	0.00023	J	0.00036	J	0.00044	J	0.0031	J
4,4'-DDT	50-29-3	ug/L	c	0.23	-	0.23	0.00028	-	0.089	6	0.089	J					0.00028	J												
Aldrin	309-00-2	ug/L	c	0.00092	-	0.00092	0.00018	-	0.0047	19	0.0046	J	0.0034	J	0.00081	J	0.00029	J	0.00061	J	0.00022	J	0.00018	J	0.0047	J			0.0018	J
alpha-BHC	319-84-6	ug/L	c	0.0072	-	0.0072	0.0001	-	0.0037	21	0.0014		0.00012	J	0.00053	J	0.00052	J	0.00038	J	0.0016	J	0.00013	J	0.00051	J	0.0037	J	0.0034	J
alpha-Chlordane	5103-71-9	ug/L	c	0.045	-	0.045	0.0001	-	0.02	17	0.0038	J	0.0016	J	0.00039	J	0.00089	J	0.0017	J	0.0013	J	0.0005	J						
beta-BHC	319-85-7	ug/L	c	0.025	-	0.025	0.0007	-	0.012	10	0.0066	J	0.0028	J					0.0023		0.0086	J							0.012	J
delta-BHC	319-86-8	ug/L	-	-	-	-	0.00015	-	0.016	18	0.016	J	0.0094		0.00015	J	0.00068	J	0.00063	J	0.00044	J	0.00044	J	0.0057					
Dieldrin	60-57-1	ug/L	c	0.0018	-	0.0018	0.0001	-	0.053	15	0.053	J	0.0015	J	0.00033	J	0.00028	J	0.00076	J					0.0011	J	0.0009	J	0.0022	J
Endosulfan I	959-98-8	ug/L	n	10	-	10	0.00017	-	0.005	18	0.0014	J			0.00076	J	0.0012	J			0.0012	J	0.00018	J	0.00078	J	0.00087	J	0.0008	J
Endosulfan II	33213-65-9	ug/L	n	10	-	10	0.00026	-	0.0043	9	0.0028	J	0.0043	J	0.00026	J	0.00062	J	0.0017	J										
Endosulfan sulfate	1031-07-8	ug/L	n	10	-	10	0.00017	-	0.0017	12	0.0015	J	0.00017	J	0.00026	J	0.00018	J					0.00024	J	0.00045	J	0.00029	J	0.0017	J
Endrin	72-20-8	ug/L	n	0.23	2	0.23	0.00016	-	0.0026	14	0.0026	J			0.00016	J	0.00022	J	0.00017	J	0.0018	J	0.00026	J	0.00023	J	0.00041	J	0.0022	J
Endrin aldehyde	7421-93-4	ug/L	n	0.23	-	0.23	0.00019	-	0.0028	11	0.002	J	0.00077	J	0.00024	J	0.00045	J					0.00048	J	0.0018	J				
Endrin ketone	53494-70-5	ug/L	n	0.23	-	0.23	0.0001	-	0.021	13	0.021	J			0.00071	J					0.00036	J	0.00014	J	0.00031	J	0.00028	J	0.00033	J
gamma-BHC (Lindane)	58-89-9	ug/L	c	0.042	0.2	0.042	0.00015	-	0.013	20	0.013	J	0.011		0.00015	J	0.0005	J			0.001	J	0.00035	J	0.0021	J	0.002	J	0.0023	J
gamma-Chlordane	5103-74-2	ug/L	c	0.045	-	0.045	0.0002	-	0.014	17	0.014	J	0.002	J	0.00025	J	0.002	J	0.0018	J	0.0008	J	0.00053	J	0.0014	J	0.0015	J	0.0049	J
Heptachlor	76-44-8	ug/L	c	0.0014	0.4	0.0014	0.00023	-	0.01	19			0.0008	J	0.00089	J	0.00082	J	0.00023	J	0.0012	J	0.00055	J	0.0069	J	0.00025	J	0.0053	J
Heptachlor epoxide	1024-57-3	ug/L	c	0.0014	0.2	0.0014	0.00018	-	0.0023	13	0.0023	J			0.00028	J	0.00044	J			0.0012	J	0.00018	J	0.00061	J	0.00072	J	0.00061	J
Methoxychlor	72-43-5	ug/L	n	3.7	40	3.7	0.0008	-	0.007	13	0.0036	J	0.0023	J	0.0011	J	0.00093	J			0.002	J			0.0019	J	0.0011	J	0.0012	J
Toxaphene	8001-35-2	ug/L	c	0.071	3	0.071	0	-	0	0																				

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than th

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerica

Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-4c
Pesticides Detected in Landfill Area Groundwater (July 2015)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S		MW09		MW11		MW12		MW20D	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
4,4´-DDD	72-54-8	c	32	-	32	NG/L	1.02	-	33.4	8			33.4																2.28	J	1.13		1.8		1.02			
4,4´-DDE	72-55-9	c	46	-	46	NG/L	2.2	-	55.4	3			2.5																				55.4					
4,4´-DDT	50-29-3	c	230	-	230	NG/L	0	-	0	0																												
Aldrin	309-00-2	c	0.92	-	0.92	NG/L	0	-	0	0																												
alpha-BHC	319-84-6	c	7.2	-	7.2	NG/L	1.23	-	4.36	2					1.23																							
alpha-Chlordane	5103-71-9	c	45	-	45	NG/L	1.89	-	2.68	3																									1.89	NJ		
beta-BHC	319-85-7	c	25	-	25	NG/L	2.56	-	2.56	1																												
delta-BHC	319-86-8	-	-	-	-	NG/L	1.66	-	1.66	1					1.66																							
Dieldrin	60-57-1	c	1.8	-	1.8	NG/L	0	-	0	0																												
Endosulfan I	959-98-8	n	10000	-	10000	NG/L	0	-	0	0																												
Endosulfan II	33213-65-9	n	10000	-	10000	NG/L	0	-	0	0																												
Endosulfan sulfate	1031-07-8	n	10000	-	10000	NG/L	0	-	0	0																												
Endrin	72-20-8	n	230	2000	230	NG/L	0	-	0	0																												
Endrin aldehyde	7421-93-4	n	230	-	230	NG/L	0	-	0	0																												
Endrin ketone	53494-70-5	n	230	-	230	NG/L	0	-	0	0																												
gamma-BHC (Lindane)	58-89-9	c	42	200	42	NG/L	0	-	0	0																												
gamma-Chlordane	5103-74-2	c	45	-	45	NG/L	1.46	-	2.34	2																												
Heptachlor	76-44-8	c	1.4	400	1.4	NG/L	0	-	0	0																												
Heptachlor epoxide	1024-57-3	c	1.4	200	1.4	NG/L	0	-	0	0																												
Methoxychlor	72-43-5	n	3700	40000	3700	NG/L	0	-	0	0																												
Toxaphene	8001-35-2	c	71	3000	71	NG/L	0	-	0	0																												

* USEPA Region III Regional Screening Level (RSL), November 2015
** Pennsylvania Maximum Contaminant Levels
Highlighted concentrations are over Project Screening Levels

Table 4-4c

Pesticides Detected in Landfill Area Groundwater (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW20I		MW20S		MW34D		MW34S		MW36		MW37	
											Result		Result		Result		Result		Result		Result	
4,4´-DDD	72-54-8	c	32	-	32	NG/L	1.02	-	33.4	8							5.42		1.63		2.79	
4,4´-DDE	72-55-9	c	46	-	46	NG/L	2.2	-	55.4	3							2.2					
4,4´-DDT	50-29-3	c	230	-	230	NG/L	0	-	0	0												
Aldrin	309-00-2	c	0.92	-	0.92	NG/L	0	-	0	0												
alpha-BHC	319-84-6	c	7.2	-	7.2	NG/L	1.23	-	4.36	2									4.36	J		
alpha-Chlordane	5103-71-9	c	45	-	45	NG/L	1.89	-	2.68	3							2.68				2.61	
beta-BHC	319-85-7	c	25	-	25	NG/L	2.56	-	2.56	1									2.56	J		
delta-BHC	319-86-8	-	-	-	-	NG/L	1.66	-	1.66	1												
Dieldrin	60-57-1	c	1.8	-	1.8	NG/L	0	-	0	0												
Endosulfan I	959-98-8	n	10000	-	10000	NG/L	0	-	0	0												
Endosulfan II	33213-65-9	n	10000	-	10000	NG/L	0	-	0	0												
Endosulfan sulfate	1031-07-8	n	10000	-	10000	NG/L	0	-	0	0												
Endrin	72-20-8	n	230	2000	230	NG/L	0	-	0	0												
Endrin aldehyde	7421-93-4	n	230	-	230	NG/L	0	-	0	0												
Endrin ketone	53494-70-5	n	230	-	230	NG/L	0	-	0	0												
gamma-BHC (Lindane)	58-89-9	c	42	200	42	NG/L	0	-	0	0												
gamma-Chlordane	5103-74-2	c	45	-	45	NG/L	1.46	-	2.34	2							2.34				1.46	J
Heptachlor	76-44-8	c	1.4	400	1.4	NG/L	0	-	0	0												
Heptachlor epoxide	1024-57-3	c	1.4	200	1.4	NG/L	0	-	0	0												
Methoxychlor	72-43-5	n	3700	40000	3700	NG/L	0	-	0	0												
Toxaphene	8001-35-2	c	71	3000	71	NG/L	0	-	0	0												

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Polychlorinated Biphenyls (PCBs) Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW02		MW03		MW04		MW05D		MW05S		MW07D		MW07S		MW11		MW12		MW20D		MW20I		MW34D		MW34S		MW36		MW37	
											03/10/14		03/11/14		03/20/14		03/18/14		03/18/14		03/25/14		03/25/14		03/25/14		03/19/14		03/26/14		03/05/14		03/14/14		03/14/14		03/19/14		03/19/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-1	2051-60-7	PG/L	-	-	-	-	62	-	2400000	15	3100		4200		54000		62		32000		200000		82000		2400000		77000		5500		460		120		110000		1100		860	
PCB-10	33146-45-1	PG/L	-	-	-	-	34	-	180000	13	420		78		4900				2100		22000		3600		180000		21000		1400		87				7100		120		34	
PCB-103	60145-21-3	PG/L	-	-	-	-	23	-	140000	7	61				740				50						140000		5500								28				23	
PCB-104	56558-16-8	PG/L	-	-	-	-	45	-	28000	4					230				45						28000		4200													
PCB-105	32598-14-4	PG/L	c	4900	-	4900	25	-	690000	8					730				97		31				690000		410		63						120		25			
PCB-106	70424-69-0	PG/L	-	-	-	-	0	-	0	0																														
PCB-107	70424-68-9	PG/L	-	-	-	-	22	-	180000	6					330				22						180000		330		27						32					
PCB-108/124	362-41-3/70424-7	PG/L	-	-	-	-	56	-	65000	3					120										65000		56													
PCB-11	2050-67-1	PG/L	-	-	-	-	20	-	180000	8					200		24		140				51		180000		550								380				20	
PCB-110/115	380-03-9/74472-3	PG/L	-	-	-	-	21	-	3100000	13	200				3900				490		90		29		3100000		2800		280		47		21		500		160		71	
PCB-111	39635-32-0	PG/L	-	-	-	-	67	-	67	1																	67													
PCB-112	74472-36-9	PG/L	-	-	-	-	0	-	0	0																														
PCB-114	74472-37-0	PG/L	c	4000	-	4000	42	-	42000	2					42										42000															
PCB-118	31508-00-6	PG/L	c	4000	-	4000	26	-	1700000	10	29				2800				320		72				1700000		1500		220		26				350		73			
PCB-12/13	974-92-7/2974-90	PG/L	-	-	-	-	28	-	1400000	11	30				8700				990		180		580		1400000		4700		440		28				5200		31			
PCB-120	68194-12-7	PG/L	-	-	-	-	58	-	15000	3					58										15000		100													
PCB-121	56558-18-0	PG/L	-	-	-	-	21	-	25000	3					21										25000		360													
PCB-122	76842-07-4	PG/L	-	-	-	-	26	-	17000	2					26										17000															
PCB-123	65510-44-3	PG/L	c	4000	-	4000	37	-	34000	3					56										34000		37													
PCB-126	57465-28-8	PG/L	c	1.2	-	1.2	0	-	0	0																														
PCB-127	39635-33-1	PG/L	-	-	-	-	0	-	0	0																														
PCB-128/166	380-07-3/41411-6	PG/L	-	-	-	-	27	-	510000	7					730				37						510000		170		73						55		27			
PCB-129/138/160/163	065-28-2/41411-6	PG/L	-	-	-	-	28	-	4600000	12	28		67		8900				330		82				4600000		6600		570		140				400		440		58	
PCB-130	52663-66-8	PG/L	-	-	-	-	25	-	220000	6					440										220000		330		28						25		38			
PCB-131	61798-70-7	PG/L	-	-	-	-	41	-	38000	3					73										38000		41													
PCB-132	38380-05-1	PG/L	-	-	-	-	22	-	1300000	10					2700				120		26				1300000		1800		170		42				140		120		22	
PCB-133	35694-04-3	PG/L	-	-	-	-	37	-	69000	4					250				37						69000		700													
PCB-134/143	704-70-8/68194-1	PG/L	-	-	-	-	22	-	190000	6					460										190000		460		31						22		22			
PCB-135/151/154	3-5/52663-63-5/60	PG/L	-	-	-	-	20	-	2200000	12	110		27		5100				200		20				2200000		7700		250		61				160		310		72	
PCB-136	38411-22-2	PG/L	-	-	-	-	30	-	770000	9	81				1600				62						770000		2300		77						59		87		30	
PCB-137	35694-06-5	PG/L	-	-	-	-	290	-	110000	3					290										110000		330													
PCB-139/140	030-56-9/59291-6	PG/L	-	-	-	-	180	-	54000	3					180										54000		320													
PCB-14	34883-41-5	PG/L	-	-	-	-	0	-	0	0																														
PCB-141	52712-04-6	PG/L	-	-	-	-	36	-	1100000	8					2000				57						1100000		1200		130		36				77		94			
PCB-142	41411-61-4	PG/L	-	-	-	-	0	-	0	0																														
PCB-144	68194-14-9	PG/L	-	-	-	-	25	-	280000	5					510										280000		380		33								25			
PCB-145	74472-40-5	PG/L	-	-	-	-	0	-	0	0																														
PCB-146	51908-16-8	PG/L	-	-	-	-	22	-	810000	10	93				2000				140						810000		2900		100		27				71		180		22	
PCB-147/149	194-13-8/38380-0	PG/L	-	-	-	-	53	-	4600000	12	280		53		11000				380		53				4600000		15000		550		150				350		590		130	
PCB-148	74472-41-6	PG/L	-	-	-	-	23	-	600	3					95				23								600													
PCB-15	2050-68-2	PG/L	-	-	-	-	22	-	4800000	14	45		23		8800				2900		4700		2000		4800000		14000		340		22		28		10000		62		55	
PCB-150	68194-08-1	PG/L	-	-	-	-	120	-	20000	3					120										20000		450													
PCB-152	68194-09-2	PG/L	-	-	-	-	96	-	450	2					96												450													
PCB-153/168	065-27-1/59291-6	PG/L	-	-	-	-	55	-	5000000	12	130		94		10000				340		55				5000000		9400		530		150				350		560		85	
PCB-155	33979-03-2	PG/L	-	-	-	-	200	-	200	1																	200													
PCB-156/157	380-08-4/69782-9	PG/L	-	4000	-	4000	48	-	330000	4					670										330000		260		48											
PCB-158	74472-42-7	PG/L	-	-	-	-	32	-	460000	7					800				33						460000		460		50						37		32			
PCB-159	39635-35-3	PG/L	-	-	-	-	170	-	110000	3					220										110000		170													
PCB-16	38444-78-9	PG/L	-	-	-	-	53	-	2400000	12	170				2900				3100		15000		2000		2400000		7600		74				53		5400		83		69	
PCB-161	74472-43-8	PG/L	-	-	-	-	0	-	0	0																														
PCB-162	39635-34-2	PG/L	-	-	-	-	22	-	22	1					22																									
PCB-164	74472-45-0	PG/L	-	-	-	-	24	-	340000	7					660				24						340000		500		42						30		36			
PCB-165	74472-46-1	PG/L	-	-	-	-	92	-	92	1																	92													
PCB-167	52663-72-6	PG/L	c	4000	-	4000	140	-	120000	3					260										120000		140													
PCB-169	32774-16-6	PG/L	c	4	-	4	0	-	0	0																														

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW02		MW03		MW04		MW05D		MW05S		MW07D		MW07S		MW11		MW12		MW20D		MW20I		MW34D		MW34S		MW36		MW37	
											03/10/14		03/11/14		03/20/14		03/18/14		03/18/14		03/25/14		03/25/14		03/25/14		03/19/14		03/26/14		03/05/14		03/14/14		03/14/14		03/19/14		03/19/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-17	37680-66-3	PG/L	-	-	-	-	39	-	5300000	14	740		39		15000				4600		17000		3000		5300000		68000		2000		160		65		11000		300		120	
PCB-170	35065-30-6	PG/L	-	-	-	-	38	-	1800000	9			38		3800				74						1800000		2600		240		69				86		190			
PCB-171/173	663-71-5/68194-1	PG/L	-	-	-	-	23	-	640000	8					1300				24						640000		930		93		23				27		72			
PCB-172	52663-74-8	PG/L	-	-	-	-	46	-	360000	5					790										360000		600		47								46			
PCB-174	38411-25-5	PG/L	-	-	-	-	38	-	2500000	9			38		4800				94						2500000		3700		300		85				97		270			
PCB-175	40186-70-7	PG/L	-	-	-	-	170	-	110000	3					210										110000		170													
PCB-176	52663-65-7	PG/L	-	-	-	-	37	-	340000	5					650										340000		610		37								41			
PCB-177	52663-70-4	PG/L	-	-	-	-	21	-	1300000	9			21		2800				67						1300000		2600		180		49				64		170			
PCB-178	52663-67-9	PG/L	-	-	-	-	23	-	530000	7					1100				60						530000		1300		65						23		71			
PCB-179	52663-64-6	PG/L	-	-	-	-	34	-	1200000	8					2200				66						1200000		2300		130		34				48		140			
PCB-18/30	680-65-2/35693-9	PG/L	-	-	-	-	23	-	7400000	15	710		58		11000		23		7000		38000		4300		7400000		39000		550		46		100		13000		300		190	
PCB-180/193	065-29-3/69782-9	PG/L	-	-	-	-	23	-	4800000	11			97		10000				210		23				4800000		7100		580		180				210		510		33	
PCB-181	74472-47-2	PG/L	-	-	-	-	38	-	87	2					38												87													
PCB-182	60145-23-5	PG/L	-	-	-	-	42	-	80	2					42												80													
PCB-183/185	663-69-1/52712-0	PG/L	-	-	-	-	56	-	1800000	8					3500				67						1800000		2500		200		56				72		180			
PCB-184	74472-48-3	PG/L	-	-	-	-	0	-	0	0																														
PCB-186	74472-49-4	PG/L	-	-	-	-	0	-	0	0																														
PCB-187	52663-68-0	PG/L	-	-	-	-	29	-	3200000	11	29	J	78	J	7100				290						3200000		7000		390	J	120				160		510		30	J
PCB-188	74487-85-7	PG/L	-	-	-	-	28	-	86	2					28												86													
PCB-189	39635-31-9	PG/L	c	4000	-	4000	97	-	64000	3					130										64000		97													
PCB-19	38444-73-4	PG/L	-	-	-	-	26	-	2000000	14	970		76		23000		26		14000		19000		2600		2000000		1200000		6900		500				11000		530		140	
PCB-190	41411-64-7	PG/L	-	-	-	-	38	-	410000	5					830										410000		610		66								38			
PCB-191	74472-50-7	PG/L	-	-	-	-	130	-	95000	3					170										95000		130													
PCB-192	74472-51-8	PG/L	-	-	-	-	0	-	0	0																														
PCB-194	35694-08-7	PG/L	-	-	-	-	31	-	1200000	9			31		2800				83						1200000		2500		170		52				49		150			
PCB-195	52663-78-2	PG/L	-	-	-	-	22	-	480000	7					1100				23						480000		1000		65		22						62			
PCB-196	42740-50-1	PG/L	-	-	-	-	22	-	770000	8					1500				44						770000		1400		85		22				31		88			
PCB-197/200	091-17-7/52663-7	PG/L	-	-	-	-	30	-	250000	5					530	J									250000		520	J	30	J							39			
PCB-198/199	194-17-2/52663-7	PG/L	-	-	-	-	35	-	1600000	9			35		3300				130						1600000		3000		200		50				71		200			
PCB-2	2051-61-8	PG/L	-	-	-	-	23	-	170000	10	51		23		830				1800		590		730		170000		1200								2100				41	
PCB-20/28	444-84-7/7012-37	PG/L	-	-	-	-	95	-	7200000	12	330				3600				3400		6500		1400		7200000		13000		100				95		6400		100		130	
PCB-201	40186-71-8	PG/L	-	-	-	-	22	-	210000	5					450										210000		400		22								29			
PCB-202	2136-99-4	PG/L	-	-	-	-	31	-	290000	6					670				38						290000		570		31								41			
PCB-203	52663-76-0	PG/L	-	-	-	-	22	-	980000	9			22		2000				70						980000		1700		110		27				49		110			
PCB-204	74472-52-9	PG/L	-	-	-	-	0	-	0	0																														
PCB-205	74472-53-0	PG/L	-	-	-	-	120	-	65000	3					130										65000		120													
PCB-206	40186-72-9	PG/L	-	-	-	-	46	-	510000	7					1200				74						510000		870		47						46		75			
PCB-207	52663-79-3	PG/L	-	-	-	-	140	-	60000	3					170										60000		140													
PCB-208	52663-77-1	PG/L	-	-	-	-	26	-	150000	5					360				26						150000		200										27			
PCB-209	2051-24-3	PG/L	-	-	-	-	20	-	390000	7					410				64						390000		85		23						20		63			
PCB-21/33	702-46-0/38444-8	PG/L	-	-	-	-	42	-	2300000	11	210				1200				2000		2700		410		2300000		8900						47		2400		42		58	
PCB-22	38444-85-8	PG/L	-	-	-	-	31	-	2100000	11	62				1100				1300		1500		320		2100000		3400						36		2300		31		33	
PCB-23	55720-44-0	PG/L	-	-	-	-	0	-	0	0																														
PCB-24	55702-45-9	PG/L	-	-	-	-	53	-	87000	6					56	Z			53		350		65		87000										140					
PCB-25	55712-37-3	PG/L	-	-	-	-	34	-	1400000	12	140				5700				960		780		280		1400000		7600		360		34				1900		71		36	
PCB-26/29	444-81-4/15862-0	PG/L	-	-	-	-	23	-	2200000	13	130				6000				1700		1500		440		2200000		5600		310		23		29		3700		65		37	
PCB-27	38444-76-7	PG/L	-	-	-	-	21	-	1300000	13	780		21		19000				2200		3100		540		1300000		73000		3100		230				4100		420		48	
PCB-3	2051-62-9	PG/L	-	-	-	-	65	-	960000	13	250		92		12000				6100		19000		6800		960000		5800		1100		80				7700		65		66	
PCB-31	16606-02-3	PG/L	-	-	-	-	91	-	6700000	12	200				4600				3700		2200		1300		6700000		13000		140				91		8200		95		100	
PCB-32	38444-77-8	PG/L	-	-	-	-	21	-	3200000	14	390		21		8300				2300		8300		1500		3200000		36000		490		34		39		5100		130		130	
PCB-34	37680-68-5	PG/L	-	-	-	-	22	-	88000	6					170				28		66		22		88000										110					
PCB-35	37680-69-6	PG/L	-	-	-	-	24	-	40000	3									24						40000										50					
PCB-36	38444-87-0	PG/L	-	-	-	-	31	-	31	1					31																									
PCB-37	38444-90-5	PG/L	-	-	-	-	27	-	700000	7					320				470		27		91		700000		1500								810					
PCB-38	53555-66-1	PG/L	-	-	-	-	0	-	0	0																														

Table 4-5a

Polychlorinated Biphenyls (PCBs) Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW02		MW03		MW04		MW05D		MW05S		MW07D		MW07S		MW11		MW12		MW20D		MW20I		MW34D		MW34S		MW36		MW37	
									03/10/14		03/11/14		03/20/14		03/18/14		03/18/14		03/25/14		03/25/14		03/25/14		03/19/14		03/26/14		03/05/14		03/14/14		03/14/14		03/19/14		03/19/14	
									Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-39	38444-88-1	PG/L	-	-	-	-	27 - 58000	3					85										58000										27					
PCB-4	13029-08-8	PG/L	-	-	-	-	80 - 6400000	15	10000		4200		140000		84		51000		310000		62000		6400000		2200000		34000		2200		80		130000		3600		580	
PCB-40/41/71	3-8/52663-59-9/41	PG/L	-	-	-	-	34 - 3100000	12	320				5300				940		83		170		3100000		13000		100				34		1500		76		190	
PCB-42	36559-22-5	PG/L	-	-	-	-	38 - 1500000	11	130				2300				420		44		70		1500000		3400		80						700		38		59	
PCB-43	70362-46-8	PG/L	-	-	-	-	23 - 240000	6					210				31				23		240000		600								130					
PCB-44/47/65	9-5/2437-79-8/33	PG/L	-	-	-	-	20 - 6800000	15	620		20		19000		69		2000		250		350		6800000		110000		640		590		68		3100		210		540	
PCB-45/51	362-45-7/68194-0	PG/L	-	-	-	-	32 - 2200000	13	360				16000				1900		430		230		2200000		140000		540		140		32		1500		150		490	
PCB-46	41464-47-5	PG/L	-	-	-	-	41 - 580000	11	110				2600				310		180		59		580000		4100		140						480		41		43	
PCB-48	70362-47-9	PG/L	-	-	-	-	33 - 910000	8	33				280				280		52		67		910000		820								430					
PCB-49/69	464-40-8/60233-2	PG/L	-	-	-	-	43 - 4800000	13	700				16000				1700		130		240		4800000		48000		700		85		43		2400		180		340	
PCB-5	16605-91-7	PG/L	-	-	-	-	150 - 80000	6					150				280		880		240		80000										230					
PCB-50/53	796-65-0/41464-4	PG/L	-	-	-	-	22 - 2200000	13	620				17000				1700		390		170		2200000		93000		1000		93		22		1700		240		450	
PCB-52	35693-99-3	PG/L	-	-	-	-	63 - 5500000	13	610				11000				2200		310		320		5500000		24000		630		71		63		2900		170		310	
PCB-54	15968-05-5	PG/L	-	-	-	-	37 - 300000	10	89				3300				750		54				300000		87000		170						230		37		120	
PCB-55	74338-24-2	PG/L	-	-	-	-	24 - 24	1					24																									
PCB-56	41464-43-1	PG/L	-	-	-	-	22 - 1200000	9	24				380				350				45		1200000		1500								510		22		24	
PCB-57	70424-67-8	PG/L	-	-	-	-	23 - 27000	4					75										27000		100								23					
PCB-58	41464-49-7	PG/L	-	-	-	-	30 - 24000	3					33										24000		30													
PCB-59/62/75	3-6/54230-22-7/32	PG/L	-	-	-	-	23 - 490000	9	27				490				140		23		35		490000		2100		28						220					
PCB-6	25569-80-6	PG/L	-	-	-	-	35 - 3700000	14	480		100		12000				5000		32000		7500		3700000		33000		990		57		35		15000		220		110	
PCB-60	33025-41-1	PG/L	-	-	-	-	93 - 540000	5					110				93						540000		160								120					
PCB-61/70/74/76	598-11-1/32690-9	PG/L	-	-	-	-	55 - 5300000	12	150				2600				1300		72		180		5300000		6800		94				55		1900		82		82	
PCB-63	74472-34-7	PG/L	-	-	-	-	21 - 140000	5					150				21						140000		340								75					
PCB-64	52663-58-8	PG/L	-	-	-	-	20 - 1800000	12	82				630				480		58		110		1800000		1700		27				20		780		32		57	
PCB-66	32598-10-0	PG/L	-	-	-	-	26 - 3000000	12	150				2100				660		26		85		3000000		5600		74				30		1100		58		64	
PCB-67	73575-53-8	PG/L	-	-	-	-	32 - 110000	5					120				39						110000		32	Z							74					
PCB-68	73575-52-7	PG/L	-	-	-	-	21 - 150000	8	25				540				28						150000		960		21		39				54					
PCB-7	33284-50-3	PG/L	-	-	-	-	65 - 170000	9	65				770				550		2900		520		170000		800		86						620					
PCB-72	41464-42-0	PG/L	-	-	-	-	20 - 95000	6	20				360				23						95000		430								40					
PCB-73	74338-23-1	PG/L	-	-	-	-	32 - 5800	5					550				42								5800		32						48					
PCB-77	32598-13-3	PG/L	c	6000	-	6000	38 - 180000	5					51				38						180000		220								69					
PCB-78	70362-49-1	PG/L	-	-	-	-	0 - 0	0																														
PCB-79	41464-48-6	PG/L	-	-	-	-	53 - 40000	3					73										40000		53													
PCB-8	34883-43-7	PG/L	-	-	-	-	30 - 8100000	15	1000		280		12000		30		9800		63000		14000		8100000		31000		650		40		80		27000		260		230	
PCB-80	33284-52-5	PG/L	-	-	-	-	0 - 0	0																														
PCB-81	70362-50-4	PG/L	c	400	-	400	6000 - 6000	1															6000															
PCB-82	52663-62-4	PG/L	-	-	-	-	37 - 280000	5					230				37						280000		160								45					
PCB-83/99	145-20-2/38380-0	PG/L	-	-	-	-	21 - 1900000	12	400				5100				330		37		21		1900000		11000		230		38				350		190		100	
PCB-84	52663-60-2	PG/L	-	-	-	-	21 - 850000	10	75				1200				190		21				850000		1200		72						220		36		31	
PCB-85/116/117	5-4/18259-05-7/68	PG/L	-	-	-	-	37 - 440000	6					550				61						440000		820		37						73					
PCB-86/87/97/109/119/	-02-8/41464-51-1/	PG/L	-	-	-	-	21 - 1800000	11	70				2800				270		56				1800000		4800		150		21				300		82		43	
PCB-88/91	215-17-3/68194-0	PG/L	-	-	-	-	65 - 610000	9	330				1600				130						610000		4900		72						150		65		66	
PCB-89	73575-57-2	PG/L	-	-	-	-	26 - 46000	3					29										46000		26													
PCB-9	34883-39-1	PG/L	-	-	-	-	26 - 290000	11	42				770				690		3500		790		290000		1400		33						1200		30		26	
PCB-90/101/113	7-0/37680-73-2/68	PG/L	-	-	-	-	26 - 3300000	14	350		27		6600				560		73		36		3300000		14000		310		56		26		520		230		140	
PCB-92	52663-61-3	PG/L	-	-	-	-	41 - 680000	9	110				1900				110						680000		4800		97						130		66		41	
PCB-93/95/98/100/102	-99-6/60233-25-2/	PG/L	-	-	-	-	30 - 3400000	13	780				7400				780		65		54		3400000		32000		290		51		30		640		240		290	
PCB-94	73575-55-0	PG/L	-	-	-	-	21 - 83000	6					780				46						83000		5400		21						31					
PCB-96	73575-54-9	PG/L	-	-	-	-	22 - 65000	5	45				410										65000		2100												22	
TEQ	2222-22-2	PG/L	-	0.1	-	0.1	0 - 112	15	0.00087		0		0.15		0		0.016		0.0031		0		112		0.095		0.0099		0		0		0.021		0.0029		0	
Total PCBs	1111-11-1	PG/L	-	44000	-	44000	320 - 180000000	15	28000		9900		600000		320		183000		770000		197000		180000000		4620000		71000		6700		1400		420000		16000		7200	

Table 4-5b

Polychlorinated Biphenyls (PCBs) Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW02	MW03	MW04	MW05D	MW05S	MW07D	MW07S	MW11	MW12	MW20D	MW20I	MW34D	MW34S	MW36	MW37
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
PCB-1	2051-60-7	pg/L	-	-	-	-	140 - 480000	15	4900	12000	41000	140	88000	300000	120000	480000	110000	2900	610	300	180000	2400	6700
PCB-10	33146-45-1	pg/L	-	-	-	-	110 - 48000	13	420	180	4400		3300	35000	7100	48000	37000 Z	610	110		9900	190	230
PCB-103	60145-21-3	pg/L	-	-	-	-	5.8 - 8700	7	190		260		130				8700				16 Z	5.8 Z	140
PCB-104	56558-16-8	pg/L	-	-	-	-	6.6 - 6000	7	8.2 J		89		96 J			2300	6000				6.6 J		19 J
PCB-105	32598-14-4	pg/L	c	4900	-	4900	4.6 - 58000	7			70		170		4.6 Z	58000			9.2 J		62		45
PCB-106	70424-69-0	pg/L	-	-	-	-	0 - 0	0															
PCB-107/PCB-124	PCB107_124	pg/L	-	-	-	-	5200 - 5200	1								5200							
PCB-109	74472-35-8	pg/L	-	-	-	-	14 - 12000	7	28		46		39 J			12000	360				14 J		38
PCB-11	2050-67-1	pg/L	-	-	-	-	160 - 1400	4			450							1400 J+			600 J+		160
PCB-110/PCB-115	PCB110_115	pg/L	-	-	-	-	7.4 - 230000	12	520	7.4 J	710		1100		45	230000	4000	25	68		320	50	670
PCB-111	39635-32-0	pg/L	-	-	-	-	0 - 0	0															
PCB-112	74472-36-9	pg/L	-	-	-	-	0 - 0	0															
PCB-114	74472-37-0	pg/L	c	4000	-	4000	0 - 0	0															
PCB-118	31508-00-6	pg/L	c	4000	-	4000	3.1 - 140000	12	95	5 J	370		640 Z			140000	1600	19 J	46	3.1 J	190	15 J	200
PCB-12/PCB-13	PCB12_13	pg/L	-	-	-	-	140 - 130000	8			6800		2800 Z		510	130000	4300	140			4100		520
PCB-120	68194-12-7	pg/L	-	-	-	-	20 - 20	1	20														
PCB-121	56558-18-0	pg/L	-	-	-	-	500 - 500	1									500 Z						
PCB-122	76842-07-4	pg/L	-	-	-	-	0 - 0	0															
PCB-123	65510-44-3	pg/L	c	4000	-	4000	0 - 0	0															
PCB-126	57465-28-8	pg/L	c	1.2	-	1.2	0 - 0	0															
PCB-127	39635-33-1	pg/L	-	-	-	-	0 - 0	0															
PCB-128/PCB-166	PCB128_166	pg/L	-	-	-	-	8.3 - 38000	8			78		71 J			38000	580		14 J		21	8.3 J	75
PCB-129/PCB-138/PCB-163	PCB129_138_16	pg/L	-	-	-	-	3.6 - 410000	14	120	31	800		620	13 J	22	410000	9200	21 J	160	3.6 Z	180	75	1400
PCB-130	52663-66-8	pg/L	-	-	-	-	7.9 - 20000	6			37					20000	410				7.9 Z	8.1 J	74
PCB-131	61798-70-7	pg/L	-	-	-	-	0 - 0	0															
PCB-132	38380-05-1	pg/L	-	-	-	-	4.5 - 120000	13	13 J	4.5 J	230		220	5 Z	8 J	120000	2500	8.6 J	45		57	23	430
PCB-133	35694-04-3	pg/L	-	-	-	-	22 - 5200	6	45		22		65 J			5200	980						40
PCB-134/PCB-143	PCB134_143	pg/L	-	-	-	-	9 - 18000	6			38		54 Z			18000	560				9 Z		87
PCB-135/PCB-151	PCB135_151	pg/L	-	-	-	-	11 - 200000	12	190	13 J	480		350 Z		16 J	200000	10000	11 Z	84		72	66	1200
PCB-136	38411-22-2	pg/L	-	-	-	-	3.5 - 66000	12	310	3.5 Z	210		160		5.4 J	66000	4500	3.7 J	25		29	22	430
PCB-137	35694-06-5	pg/L	-	-	-	-	26 - 6500	3			26					6500	360						
PCB-139/PCB-140	PCB139_140	pg/L	-	-	-	-	360 - 4000	2								4000	360						
PCB-14	34883-41-5	pg/L	-	-	-	-	0 - 0	0															
PCB-141	52712-04-6	pg/L	-	-	-	-	3.7 - 110000	10			160		120 Z	3.7 J		110000	1600	4 J	37		30	16 J	330
PCB-142	41411-61-4	pg/L	-	-	-	-	0 - 0	0															
PCB-144	68194-14-9	pg/L	-	-	-	-	5.6 - 430	6			47						430 Z		8.6 J		7.8 J	5.6 Z	110
PCB-145	74472-40-5	pg/L	-	-	-	-	0 - 0	0															
PCB-146	51908-16-8	pg/L	-	-	-	-	3.8 - 65000	12	400	5.5 Z	180		280		4.8 J	65000	3900	3.8 Z	31		30	34	450
PCB-147/PCB-149	PCB147_149	pg/L	-	-	-	-	2.7 - 430000	15	1300	23	1100	2.7 Z	870	14 J	30	430000	23000	26	190	3.1 Z	170	130	2500
PCB-148	74472-41-6	pg/L	-	-	-	-	23 - 1000	3	23				63 Z				1000						
PCB-15	2050-68-2	pg/L	-	-	-	-	67 - 490000	11	67 Z		7300		5400 Z	2600	2200	490000	14000	100	67 Z		10000		890
PCB-150	68194-08-1	pg/L	-	-	-	-	16 - 780	3	71		16 J						780						
PCB-152	68194-09-2	pg/L	-	-	-	-	15 - 760	2			15 Z						760						
PCB-153/PCB-168	PCB153_168	pg/L	-	-	-	-	3.2 - 420000	14	610	52	890		670	13 J	25	420000	13000	21 J	160	3.2 Z	150	110	2000
PCB-154	60145-22-4	pg/L	-	-	-	-	8.4 - 2800	6	270		68		97 Z				2800					8.4 J	130
PCB-155	33979-03-2	pg/L	-	-	-	-	30 - 240	2					30 Z				240						
PCB-156/PCB-157	PCB156_157	pg/L	-	4000	-	4000	4.8 - 32000	8			69		49 Z			32000	360		11 J		14 J	4.8 J	47
PCB-158	74472-42-7	pg/L	-	-	-	-	4.4 - 38000	8			63		60 Z			38000	550		13 J		14 Z	4.4 Z	99
PCB-159	39635-35-3	pg/L	-	-	-	-	9.3 - 190	2			9.3 J						190						
PCB-16	38444-78-9	pg/L	-	-	-	-	8.6 - 340000	12	220	27 Z	2000	8.6 J	4300	16000	2800	340000	8600				5400	120	320
PCB-160	41411-62-5	pg/L	-	-	-	-	160 - 160	1													160		
PCB-161	74472-43-8	pg/L	-	-	-	-	0 - 0	0															
PCB-162	39635-34-2	pg/L	-	-	-	-	8.9 - 1300	4			8.9 J					1300	120						16 J
PCB-164	74472-45-0	pg/L	-	-	-	-	4.4 - 31000	8			48		41 Z			31000	610		11 J		10 Z	4.4 J	120
PCB-165	74472-46-1	pg/L	-	-	-	-	0 - 0	0															
PCB-167	52663-72-6	pg/L	c	4000	-	4000	5.6 - 11000	5			25					11000	180				5.6 Z		25
PCB-169	32774-16-6	pg/L	c	4	-	4	0 - 0	0															
PCB-17	37680-66-3	pg/L	-	-	-	-	9.8 - 560000	14	930	62	11000	9.8 J	6400	16000	4100	560000	89000	540	210		11000	350	990
PCB-170	35065-30-6	pg/L	-	-	-	-	4.4 - 170000	11	17 J	11 Z	320		100			170000	3800	4.4 Z	73		32	21	460
PCB-171/PCB-173	PCB171_173	pg/L	-	-	-	-	2.7 - 57000	10	7.1 J	2.7 Z	110		33 Z			57000	1500		23		8.6 Z	6.7 Z	170
PCB-172	52663-74-8	pg/L	-	-	-	-	5.1 - 32000	8	5.4 Z		68					32000	860		15 Z		6.7 Z	5.1 Z	100
PCB-174	38411-25-5	pg/L	-	-	-	-	4.6 - 240000	12	30	13 J	440		130 Z		4.6 J	240000	7500	6 Z	100		45	47	860
PCB-175	40186-70-7	pg/L	-	-	-	-	16 - 8700	4			16 J					8700	270						32

Table 4-5b

Polychlorinated Biphenyls (PCBs) Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW02	MW03	MW04	MW05D	MW05S	MW07D	MW07S	MW11	MW12	MW20D	MW20I	MW34D	MW34S	MW36	MW37
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
PCB-176	52663-65-7	pg/L	-	-	-	-	4.4 - 26000	9	6.6 Z		45		27 Z			26000	940		9.4 Z		4.4 J	5.9 Z	110
PCB-177	52663-70-4	pg/L	-	-	-	-	3.8 - 120000	11	28	7.2 J	240		120			120000	4400	3.8 J	50		21 Z	23	410
PCB-178	52663-67-9	pg/L	-	-	-	-	4.5 - 43000	10	28	4.5 J	92		130 Z			43000	2100		18 J		8.5 Z	11 J	180
PCB-179	52663-64-6	pg/L	-	-	-	-	2.4 - 98000	11	34 Z	5 J	180		150			98000	4200	2.4 Z	39		19 J	27	450
PCB-18/PCB-30	PCB18_30	pg/L	-	-	-	-	9.9 - 900000	15	880	96	8400	21 Z	12000	39000	6000	900000	52000	180	63	9.9 J	13000	430	1100
PCB-180/PCB-193	PCB180_193	pg/L	-	-	-	-	4.6 - 440000	13	56	41	860		370	4.6 Z	5.2 J	440000	11000	14 J	190		88	79	1300
PCB-181	74472-47-2	pg/L	-	-	-	-	140 - 140	1									140						
PCB-182	60145-23-5	pg/L	-	-	-	-	0 - 0	0															
PCB-183	52663-69-1	pg/L	-	-	-	-	2 - 110000	13	17 J	9.2 Z	230		83 J	2 Z	2.9 Z	110000	3400	3.6 Z	48		26	20	290
PCB-184	74472-48-3	pg/L	-	-	-	-	0 - 0	0															
PCB-185	52712-05-7	pg/L	-	-	-	-	6.1 - 24000	7			39					24000	660		11 Z		7.6 Z	6.1 J	130
PCB-186	74472-49-4	pg/L	-	-	-	-	0 - 0	0															
PCB-187	52663-68-0	pg/L	-	-	-	-	6.1 - 260000	12	170	38	510		530		6.1 Z	260000	10000	7.2 J	110		54	72	1100
PCB-188	74487-85-7	pg/L	-	-	-	-	2.8 - 130	3	5.7 J								130						2.8 Z
PCB-189	39635-31-9	pg/L	c	4000	-	4000	8.6 - 5400	4			8.6 J					5400	120						20
PCB-19	38444-73-4	pg/L	-	-	-	-	14 - 1700000	15	1300	170	24000	14 J	17000	31000	4200	300000	1700000	3000	740	38	20000	860	570
PCB-190	41411-64-7	pg/L	-	-	-	-	2.4 - 35000	7		2.4 J	69					35000	740		15 J		5.9 Z		100
PCB-191	74472-50-7	pg/L	-	-	-	-	2.4 - 8500	6			12 J					8500	200		2.4 Z		2.5 Z		25
PCB-192	74472-51-8	pg/L	-	-	-	-	0 - 0	0															
PCB-194	35694-08-7	pg/L	-	-	-	-	9 - 110000	10	33	9 Z	200		140			110000	2400		39		17 J	23	300
PCB-195	52663-78-2	pg/L	-	-	-	-	4 - 36000	7			68					36000	1000		14 J		4 J	7.9 J	110
PCB-196	42740-50-1	pg/L	-	-	-	-	11 - 56000	9	19 J		110		74 J			56000	1800		23		11 J	15 J	170
PCB-197	33091-17-7	pg/L	-	-	-	-	6.7 - 3400	4			6.7 J					3400	140						17 J
PCB-198/PCB-199	PCB198_199	pg/L	-	-	-	-	3.5 - 120000	11	46	12 J	250		300			120000	4300	3.5 Z	45		32	31	400
PCB-2	2051-61-8	pg/L	-	-	-	-	6.5 - 14000	7				6.5 J	3200		560	14000					2000	14 Z	130
PCB-20/PCB-28	PCB20_28	pg/L	-	-	-	-	14 - 920000	13	550	19 J	2300	14 Z	6400	6100	1700	920000	21000	26			5900	87	1200
PCB-200	52663-73-7	pg/L	-	-	-	-	4.9 - 16000	8	5.6 Z		31		45 Z			16000	680		6.7 J			4.9 J	52
PCB-201	40186-71-8	pg/L	-	-	-	-	3.5 - 15000	8	6.8 J		33		34 J			15000	650		6 J		3.5 Z		53
PCB-202	2136-99-4	pg/L	-	-	-	-	7.1 - 21000	9	12 J		46		89 J			21000	780		8.3 J		8.2 Z	7.1 Z	74
PCB-203	52663-76-0	pg/L	-	-	-	-	6.8 - 70000	10	18 J	6.8 Z	140		130			70000	2200		28		19 J	18 J	220
PCB-204	74472-52-9	pg/L	-	-	-	-	0 - 0	0															
PCB-205	74472-53-0	pg/L	-	-	-	-	10 - 5900	4			10 Z					5900	170						19 J
PCB-206	40186-72-9	pg/L	-	-	-	-	10 - 41000	9	17 J		82		220			41000	1000		14 J		28	10 J	83
PCB-207	52663-79-3	pg/L	-	-	-	-	2.9 - 4700	5			11 J					4700	160				2.9 Z		11 Z
PCB-208	52663-77-1	pg/L	-	-	-	-	4.1 - 11000	9	6.7 J		26		79 Z			11000	210		4.7 Z		11 Z	4.1 J	23
PCB-209	2051-24-3	pg/L	-	-	-	-	4.3 - 36000	7	13 Z	4.3 J	46		93 J			36000	140				12 J		
PCB-21/PCB-33	PCB21_33	pg/L	-	-	-	-	8.3 - 310000	12	280	8.3 J	250	8.7 J	2700 Z	2600	500	310000	4400				2000	32	230
PCB-22	38444-85-8	pg/L	-	-	-	-	4.8 - 290000	12	89	6.9 J	550	4.8 Z	2100	1500	380	290000	4300				2000	26	230
PCB-23	55720-44-0	pg/L	-	-	-	-	0 - 0	0															
PCB-24	55702-45-9	pg/L	-	-	-	-	0 - 0	0															
PCB-25	55712-37-3	pg/L	-	-	-	-	5.8 - 160000	13	240	5.8 J	3700		2400	770	350	160000	8100	77	57		1600	66	520
PCB-26/PCB-29	PCB26_29	pg/L	-	-	-	-	9.1 - 240000	13	190	9.1 Z	3800		3900	1400	510	240000	7300	67	45		2700	56	620
PCB-27	38444-76-7	pg/L	-	-	-	-	2.7 - 140000	14	1100	29	16000	2.7 Z	4100	3400	820	140000	110000	1000	350		5800	660	530
PCB-3	2051-62-9	pg/L	-	-	-	-	7.8 - 180000	15	410	200	7300	29	17000 Z	20000	10000	180000	8000	570	180	7.8 J	11000	49	1400
PCB-31	16606-02-3	pg/L	-	-	-	-	13 - 780000	14	330	23	2800	13 J	6500	2100	1600	780000	17000	36	22		6200	79	860
PCB-32	38444-77-8	pg/L	-	-	-	-	4.7 - 310000	14	400	29	5100	4.7 J	3800	6700	2100	310000	43000	110	47		4500	130	540
PCB-34	37680-68-5	pg/L	-	-	-	-	0 - 0	0															
PCB-35	37680-69-6	pg/L	-	-	-	-	14 - 14	1										14 Z					
PCB-36	38444-87-0	pg/L	-	-	-	-	26 - 1000	3	29								1000						26
PCB-37	38444-90-5	pg/L	-	-	-	-	21 - 110000	7	21				690		110	110000	1200				560		140
PCB-38	53555-66-1	pg/L	-	-	-	-	0 - 0	0															
PCB-39	38444-88-1	pg/L	-	-	-	-	0 - 0	0															
PCB-4	13029-08-8	pg/L	-	-	-	-	77 - 3400000	15	12000	11000	140000	77 Z	80000	410000	96000	1200000	3400000	15000	3000	290	210000	5800	3700
PCB-40/PCB-71	PCB40_71	pg/L	-	-	-	-	2.5 - 260000	14	530	5.9 J	2700	2.5 Z	1900	76	210	260000	19000	14 J	16 J		1200	51	700
PCB-41	52663-59-9	pg/L	-	-	-	-	16 - 31000	3					110		16 J	31000							
PCB-42	36559-22-5	pg/L	-	-	-	-	2.8 - 130000	13	230	2.8 J	1200		850	40	96	130000	4700	13 Z	15 J		600	27	290
PCB-43	70362-46-8	pg/L	-	-	-	-	18 - 24000	7			130		140	18 J	34	24000					130		34
PCB-44/PCB-47/PCB-65	PCB44_47_65	pg/L	-	-	-	-	21 - 570000	15	1400	34	11000	31	4800	290	550	570000	180000	130	140	21	3100	160	1800
PCB-45	70362-45-7	pg/L	-	-	-	-	9.4 - 72000	8	62				540	420	180	72000					540	9.4 J	100
PCB-46	41464-47-5	pg/L	-	-	-	-	3.6 - 52000	13	170	3.6 Z	1800		700	190	87	52000	6000	39	17 J		490	52	180
PCB-48	70362-47-9	pg/L	-	-	-	-	10 - 91000	8	61				560	57	94	91000					380	10 J	110
PCB-49/PCB-69	PCB49_69	pg/L	-	-	-	-	3.9 - 420000	15	1500	14 J	9100	3.9 J	4400	130	350	420000	77000	130	140	4.1 Z	2300	130	1300
PCB-5	16605-91-7	pg/L	-	-	-	-	72 - 38000	6			460			2900	900	38000					1800		72

Table 4-5b

Polychlorinated Biphenyls (PCBs) Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW02	MW03	MW04	MW05D	MW05S	MW07D	MW07S	MW11	MW12	MW20D	MW20I	MW34D	MW34S	MW36	MW37
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
PCB-50/PCB-53	PCB50_53	pg/L	-	-	-	-	3.1 - 170000	14	1100	11 J	11000	3.1 J	3000	410	250	170000	140000	250	130		1700	260	1200
PCB-51	68194-04-7	pg/L	-	-	-	-	11 - 220000	15	560	40	9200	11 J	2900	110	170	110000	220000	110	76	35	1100	130	980
PCB-52	35693-99-3	pg/L	-	-	-	-	8 - 610000	14	1400	22	7500		6000	350	510	610000	48000	150	120	8 J	3100	170	1800
PCB-54	15968-05-5	pg/L	-	-	-	-	23 - 150000	12	140		2900		1100	62	23	22000	150000	63	25		370	50	250
PCB-55	74338-24-2	pg/L	-	-	-	-	0 - 0	0															
PCB-56	41464-43-1	pg/L	-	-	-	-	7.5 - 130000	10	55		110		580	7.5 J	49	130000	1900				300	7.5 Z	190
PCB-57	70424-67-8	pg/L	-	-	-	-	4.7 - 130	5	41		30 Z				4.7 J		130				20		
PCB-58	41464-49-7	pg/L	-	-	-	-	9.6 - 470	3	9.6 J		24 Z						470						
PCB-59/PCB-62/PCB-75	PCB59_62_75	pg/L	-	-	-	-	5.3 - 44000	11	50		240		300	22 Z	50	44000	3000		5.3 J		210	9 Z	99
PCB-6	25569-80-6	pg/L	-	-	-	-	110 - 430000	13	610	240	9700		12000	29000	7700	430000	48000	350	110		15000	270	1400
PCB-60	33025-41-1	pg/L	-	-	-	-	13 - 65000	5					140 Z		13 J	65000	190				75		
PCB-61/PCB-70/PCB-74/PCB-7	PCB61_70_74_76	pg/L	-	-	-	-	4.5 - 480000	14	300	8.3 J	750	4.5 Z	2400	33	190	480000	7500	17 J	20 J		1100	26	590
PCB-63	74472-34-7	pg/L	-	-	-	-	9.9 - 14000	8	9.9 J		45 Z		39 Z		11 J	14000	410 Z				47		11 J
PCB-64	52663-58-8	pg/L	-	-	-	-	1.9 - 160000	12	120	2.4 J	230	1.9 J	890	49	140	160000			5.8 Z		570	17 J	330
PCB-66	32598-10-0	pg/L	-	-	-	-	10 - 340000	12	360		870		1600	20	120	340000	8200	10 Z	20 J		720	19 J	570
PCB-67	73575-53-8	pg/L	-	-	-	-	6.9 - 11000	8	16 J		55		60 Z		6.9 J	11000	290				45		16 Z
PCB-68	73575-52-7	pg/L	-	-	-	-	4 - 9100	10	66	4 J	240		54 Z	6.5 J	5.7 J	9100	1400				37 Z		22
PCB-7	33284-50-3	pg/L	-	-	-	-	76 - 2200	7	76		250		940	2200	440						610		190
PCB-72	41464-42-0	pg/L	-	-	-	-	4.6 - 740	7	60 Z		180		54 Z		4.6 J		740				29 Z		27
PCB-73	74338-23-1	pg/L	-	-	-	-	13 - 8600	6			350		160				8600	13 J			83		21
PCB-77	32598-13-3	pg/L	c	6000	-	6000	41 - 24000	5					93 J			24000	260 Z				42		41
PCB-78	70362-49-1	pg/L	-	-	-	-	0 - 0	0															
PCB-79	41464-48-6	pg/L	-	-	-	-	0 - 0	0															
PCB-8	34883-43-7	pg/L	-	-	-	-	55 - 980000	14	1300	680	9400	55 Z	18000	64000	15000	980000	53000	210	72		35000	310	1100
PCB-80	33284-52-5	pg/L	-	-	-	-	0 - 0	0															
PCB-81	70362-50-4	pg/L	c	400	-	400	0 - 0	0															
PCB-82	52663-62-4	pg/L	-	-	-	-	35 - 26000	4					78 J			26000					35		40
PCB-83	60145-20-2	pg/L	-	-	-	-	18 - 54	2			54										18 J		
PCB-84	52663-60-2	pg/L	-	-	-	-	11 - 64000	11	160		370		440		24	64000	1800	11 J	12 J		130	16 J	190
PCB-85/PCB-116/PCB-117	PCB85_116_117	pg/L	-	-	-	-	4.7 - 32000	8			85		120		6 J	32000	970				40	4.7 J	49
PCB-86/PCB-87/PCB-97/PCB-1	PCBCONGPK302	pg/L	-	-	-	-	13 - 140000	11	210		570		580		24	140000	6800	13 J	31		180	26	340
PCB-88	55215-17-3	pg/L	-	-	-	-	340 - 370	2	NA	NA	NA		340	NA	NA	NA	NA	NA	NA	NA	NA	NA	370
PCB-88/PCB-91	PCB88_91	pg/L	-	-	-	-	9.5 - 42000	11	850		430		340		16 J	42000	7700	9.5 J	15 J		84	23	370
PCB-89	73575-57-2	pg/L	-	-	-	-	0 - 0	0															
PCB-9	34883-39-1	pg/L	-	-	-	-	32 - 27000	9			480		1400	3900	820	27000	1700				1300	32	96
PCB-90/PCB-101/PCB-113	PCB90_101_113	pg/L	-	-	-	-	14 - 260000	12	1100	14 Z	1300		1200		49	260000	20000	32	86		340	76	1300
PCB-91	68194-05-8	pg/L	-	-	-	-	340 - 340	1	NA	NA	NA	NA	340	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-92	52663-61-3	pg/L	-	-	-	-	10 - 52000	11	320		480		240		13 J	52000	7900	10 J	27 Z		87	22	360
PCB-93/PCB-100	PCB93_100	pg/L	-	-	-	-	3.9 - 28000	8	200		460		410			18000	28000	3.9 J			37		110
PCB-94	73575-55-0	pg/L	-	-	-	-	2.9 - 8600	8	27		270		130 Z				8600	2.9 Z			17 J	5 J	67
PCB-95	38379-99-6	pg/L	-	-	-	-	3.2 - 220000	13	1500	13 J	1100	3.2 J	1200		74	220000	8400	26	37		340	100	1400
PCB-96	73575-54-9	pg/L	-	-	-	-	1.4 - 4900	10	100		170		52 J		3.3 J	4900	3900		1.4 Z		17 J	5.8 J	89
PCB-98/PCB-102	PCB98_102	pg/L	-	-	-	-	5.4 - 18000	9	290		540		170 Z			18000	13000	5.4 J			53	19 J	330
PCB-99	38380-01-7	pg/L	-	-	-	-	5.4 - 120000	12	1100		960		650	5.4 Z	25	120000	15000	18 J	49		190	51	850
Total DiCB	25512-42-9	pg/L	-	-	-	-	130 - 3600000	15	15000 Z	12000	190000	130 Z	120000 Z	540000	140000	3400000	3600000 Z	18000	4500 Z	410	290000	6600	8400
Total HpCB	28655-71-2	pg/L	-	-	-	-	6.6 - 1700000	13	410 Z	130 Z	3200		1700 Z	6.6 Z	19 Z	1700000	53000	41 Z	700 Z		330 Z	320 Z	5700 Z
Total HxCB	26601-64-9	pg/L	-	-	-	-	2.7 - 2100000	15	3300	130 Z	4600 Z	2.7 Z	3800 Z	48 Z	110	2100000	79000 Z	99 Z	780	9.9 Z	950 Z	520 Z	9600
Total MoCB	27323-18-8	pg/L	-	-	-	-	170 - 660000	15	5300	13000	50000	170	110000 Z	310000	130000	660000	110000	3500	790	310	200000	2500 Z	8200
Total NoCB	53742-07-7	pg/L	-	-	-	-	14 - 57000	9	24		120		300 Z			57000	1400		19 Z		42 Z	14 J	120 Z
Total OcCB	55722-26-4	pg/L	-	-	-	-	3.5 - 450000	11	140 Z	28 Z	890 Z		810 Z			450000	14000	3.5 Z	170		94 Z	110 Z	1400
Total PCBs	1111-11-1	pg/L	-	-	-	44000	850 - 1.9E+07	9	NA	NA	400000 Z	NA	NA	1000000 Z	300000 Z	19000000 Z	3600000 Z	28000 Z	9600 Z	850 Z	590000 Z	NA	NA
Total PeCB	25429-29-2	pg/L	-	-	-	-	3.1 - 1400000	15	6700	39 Z	8300 Z	3.2 J	7800 Z	72 Z	300 Z	1400000	140000 Z	180 Z	380 Z	3.1 J	2200 Z	430 Z	6600
Total TeCB	26914-33-0	pg/L	-	-	-	-	66 - 3900000	15	8200 Z	150 Z	60000 Z	66 Z	33000 Z	2300 Z	3200	3900000 Z	710000 Z	940 Z	740 Z	69 Z	18000 Z	1100 Z	11000 Z
Total TEQ	2222-22-2	pg/L	-	0.1	-	0.1	9E-05 - 9.8	14	0.0028	0.00015	0.017		0.035	0.00021	0.00071	9.8	0.095	0.00057	0.002	0.000092	0.012	0.0006	0.014
Total TrCB	25323-68-6	pg/L	-	-	-	-	48 - 5400000	15	6500	480 Z	80000	100 Z	72000 Z	130000	25000	5400000	2100000 Z	5100 Z	1500	48	80000	2900	7900

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Dioxins Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S	
											03/10/14		03/10/14		03/10/14		03/11/14		03/20/14		03/18/14		03/18/14		03/11/14		03/25/14		03/25/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,2,3,4,6,7,8-HpCDD	35822-46-9	PG/L	-	-	-	-	57	-	190000	3									220				57							
1,2,3,4,6,7,8-HpCDF	67562-39-4	PG/L	-	-	-	-	3200	-	3200	1																				
1,2,3,4,7,8,9-HpCDF	55673-89-7	PG/L	-	-	-	-	300	-	300	1																				
1,2,3,4,7,8-HxCDD	39227-28-6	PG/L	-	-	-	-	730	-	730	1																				
1,2,3,4,7,8-HxCDF	70648-26-9	PG/L	-	-	-	-	340	-	340	1																				
1,2,3,6,7,8-HxCDD	57653-85-7	PG/L	-	-	-	-	4900	-	4900	1																				
1,2,3,6,7,8-HxCDF	57117-44-9	PG/L	-	-	-	-	210	-	210	1																				
1,2,3,7,8,9-HxCDD	19408-74-3	PG/L	-	-	-	-	5800	-	5800	1																				
1,2,3,7,8,9-HxCDF	72918-21-9	PG/L	-	-	-	-	0	-	0	0																				
1,2,3,7,8-PeCDD	40321-76-4	PG/L	-	-	-	-	540	-	540	1																				
1,2,3,7,8-PeCDF	57117-41-6	PG/L	-	-	-	-	84	-	84	1																				
2,3,4,6,7,8-HxCDF	60851-34-5	PG/L	-	-	-	-	110	-	110	1																				
2,3,4,7,8-PeCDF	57117-31-4	PG/L	-	-	-	-	110	-	110	1																				
2,3,7,8-TCDD	1746-01-6	PG/L	c	0.12	30	0.12	110	-	110	1																				
2,3,7,8-TCDF	51207-31-9	PG/L	-	-	-	-	190	-	190	1																				
OCDD	3268-87-9	PG/L	-	-	-	-	99	-	870000	10			99						2100				270		190					
OCDF	39001-02-0	PG/L	-	-	-	-	5400	-	5400	1																				
TEQ WHO1998 Bird ND=0	TEQ	PG/L	-	-	-	-	0	-	2100	-	0		0.0099		0		0		0.43		0		0.084		0.019		0		0	
TEQ WHO1998 Fish ND=0	TEQ	PG/L	-	-	-	-	0	-	1800	-	0		0.0099		0		0		0.45		0		0.084		0.019		0		0	
TEQ WHO2005 ND=0	TEQ	PG/L	c	0.12	30	0.12	0	-	4100	-	0		0.03		0		0		2.8		0		0.65		0.057		0		0	
Total HpCDD	37871-00-4	PG/L	-	-	-	-	110	-	320000	4									510				110							
Total HpCDF	38998-75-3	PG/L	-	-	-	-	12000	-	12000	1																				
Total HxCDD	34465-46-8	PG/L	-	-	-	-	62000	-	62000	2																				
Total HxCDF	55684-94-1	PG/L	-	-	-	-	5200	-	5200	1																				
Total PeCDD	36088-22-9	PG/L	-	-	-	-	6600	-	6600	2																				
Total PeCDF	30402-15-4	PG/L	-	-	-	-	1700	-	1700	1																				
Total TCDD	41903-57-5	PG/L	-	-	-	-	14	-	1300	6																	14		15	
Total TCDF	55722-27-5	PG/L	-	-	-	-	110	-	1300	2									110											

Table 4-6a

Dioxins Detected in Landfill Area Groundwater (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW09		MW11		MW12		MW20D		MW20I		MW34D		MW34S		MW36		MW37	
											03/11/14		03/25/14		03/19/14		03/26/14		03/05/14		03/14/14		03/14/14		03/19/14		03/19/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,2,3,4,6,7,8-HpCDD	35822-46-9	PG/L	-	-	-	-	57	-	190000	3			190000															
1,2,3,4,6,7,8-HpCDF	67562-39-4	PG/L	-	-	-	-	3200	-	3200	1			3200															
1,2,3,4,7,8,9-HpCDF	55673-89-7	PG/L	-	-	-	-	300	-	300	1			300															
1,2,3,4,7,8-HxCDD	39227-28-6	PG/L	-	-	-	-	730	-	730	1			730															
1,2,3,4,7,8-HxCDF	70648-26-9	PG/L	-	-	-	-	340	-	340	1			340															
1,2,3,6,7,8-HxCDD	57653-85-7	PG/L	-	-	-	-	4900	-	4900	1			4900															
1,2,3,6,7,8-HxCDF	57117-44-9	PG/L	-	-	-	-	210	-	210	1			210															
1,2,3,7,8,9-HxCDD	19408-74-3	PG/L	-	-	-	-	5800	-	5800	1			5800															
1,2,3,7,8,9-HxCDF	72918-21-9	PG/L	-	-	-	-	0	-	0	0																		
1,2,3,7,8-PeCDD	40321-76-4	PG/L	-	-	-	-	540	-	540	1			540															
1,2,3,7,8-PeCDF	57117-41-6	PG/L	-	-	-	-	84	-	84	1			84															
2,3,4,6,7,8-HxCDF	60851-34-5	PG/L	-	-	-	-	110	-	110	1			110															
2,3,4,7,8-PeCDF	57117-31-4	PG/L	-	-	-	-	110	-	110	1			110															
2,3,7,8-TCDD	1746-01-6	PG/L	c	0.12	30	0.12	110	-	110	1			110															
2,3,7,8-TCDF	51207-31-9	PG/L	-	-	-	-	190	-	190	1			190	J														
OCDD	3268-87-9	PG/L	-	-	-	-	99	-	870000	10			870000										290		400			
OCDF	39001-02-0	PG/L	-	-	-	-	5400	-	5400	1			5400															
TEQ WHO1998 Bird ND=0	TEQ	PG/L	-	-	-	-	0	-	2100	-	0		2100		0		0		0		0		0.029		0.04		0	
TEQ WHO1998 Fish ND=0	TEQ	PG/L	-	-	-	-	0	-	1800	-	0		1800		0		0		0		0		0.029		0.04		0	
TEQ WHO2005 ND=0	TEQ	PG/L	c	0.12	30	0.12	0	-	4100	-	0		4100		0		0		0		0		0.087		0.12		0	
Total HpCDD	37871-00-4	PG/L	-	-	-	-	110	-	320000	4			320000															
Total HpCDF	38998-75-3	PG/L	-	-	-	-	12000	-	12000	1			12000															
Total HxCDD	34465-46-8	PG/L	-	-	-	-	62000	-	62000	2			62000															
Total HxCDF	55684-94-1	PG/L	-	-	-	-	5200	-	5200	1			5200															
Total PeCDD	36088-22-9	PG/L	-	-	-	-	6600	-	6600	2			6600															
Total PeCDF	30402-15-4	PG/L	-	-	-	-	1700	-	1700	1			1700															
Total TCDD	41903-57-5	PG/L	-	-	-	-	14	-	1300	6			1300								17							
Total TCDF	55722-27-5	PG/L	-	-	-	-	110	-	1300	2			1300															

Table 4-6b

Dioxins Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D	
											Result		Result		Result		Result		Result		Result		Result		Result		Result	
1,2,3,4,6,7,8-HpCDD	35822-46-9	pg/L	-	-	-	-	24.9	-	94400	3													52.4					
1,2,3,4,6,7,8-HpCDF	67562-39-4	pg/L	-	-	-	-	2.52	-	1200	2																		
1,2,3,4,7,8,9-HpCDF	55673-89-7	pg/L	-	-	-	-	0	-	0	0																		
1,2,3,4,7,8-HxCDD	39227-28-6	pg/L	-	-	-	-	0.716	-	248	5	0.716	Z	0.769	J			0.792	J										
1,2,3,4,7,8-HxCDF	70648-26-9	pg/L	-	-	-	-	0.441	-	3.25	8	0.724	Z	0.862	Z	1.49	J	1.16	Z	1.41	J								
1,2,3,6,7,8-HxCDD	57653-85-7	pg/L	-	-	-	-	0.915	-	1920	5	1.2	J	1.38	Z			0.915	Z										
1,2,3,6,7,8-HxCDF	57117-44-9	pg/L	-	-	-	-	0.366	-	1.62	6	0.986	Z	1.18	J			1.03	Z	0.569	Z								
1,2,3,7,8,9-HxCDD	19408-74-3	pg/L	-	-	-	-	0.427	-	2490	7	1.3	Z	2.05	J	1.74	J			0.491	J							1.21	Z
1,2,3,7,8,9-HxCDF	72918-21-9	pg/L	-	-	-	-	1.07	-	1.4	3	1.07	Z	1.12	Z			1.4	J										
1,2,3,7,8-PeCDD	40321-76-4	pg/L	-	-	-	-	0	-	0	0																		
1,2,3,7,8-PeCDF	57117-41-6	pg/L	-	-	-	-	0	-	0	0																		
2,3,4,6,7,8-HxCDF	60851-34-5	pg/L	-	-	-	-	0.724	-	1.46	4	0.724	Z	1.03	Z			1.01	Z										
2,3,4,7,8-PeCDF	57117-31-4	pg/L	-	-	-	-	0.894	-	0.894	1																		
2,3,7,8-TCDD	1746-01-6	pg/L	c	0.12	30	0.12	1.22	-	49.1	2																		
2,3,7,8-TCDF	51207-31-9	pg/L	-	-	-	-	100	-	100	1																		
OCDD	3268-87-9	pg/L	-	-	-	-	103	-	576000	10			103		1150				161				491		547			
OCDF	39001-02-0	pg/L	-	-	-	-	0.916	-	3240	5									8.15	J					6.25	Z		
Total HpCDD	37871-00-4	pg/L	-	-	-	-	59.1	-	160000	6					69.4								133		106			
Total HpCDF	38998-75-3	pg/L	-	-	-	-	2.52	-	4940	2																		
Total HxCDD	34465-46-8	pg/L	-	-	-	-	0.734	-	26200	15	3.22	Z	6.62	Z	24.4	Z	1.71	Z	6.36	Z			21.4		9.46	J	1.21	Z
Total HxCDF	55684-94-1	pg/L	-	-	-	-	0.67	-	1880	11	3.5	Z	4.19	Z	1.49	J	4.6	Z	3.18	Z			2.81	J	2.21	Z		
Total PeCDD	36088-22-9	pg/L	-	-	-	-	0.54	-	2640	7					8.37	J			0.923	Z					1.56	Z		
Total PeCDF	30402-15-4	pg/L	-	-	-	-	0.518	-	628	4					0.605	Z			0.518	Z								
Total TCDD	41903-57-5	pg/L	-	-	-	-	1.22	-	737	7					16.5	Z											12.3	Z
Total TCDF	55722-27-5	pg/L	-	-	-	-	0.592	-	743	4									0.592	Z					1.35	J		
Total TEQ - Bird	2222-20-0	pg/L	-	-	-	-	1.41	-	933	19	2.73		2.63		3.07		2.69		2.24		8.83		10.3		1.99		8.6	
Total TEQ - Fish	2222-21-0	pg/L	-	-	-	-	1.21	-	618	19	2.36		2.28		2.6		2.45		1.63		5.98		5.72		1.76		5.91	
Total TEQ - Mammal	3333-30-0	pg/L	c	0.12	30	0.12	0	-	1641	19	0.565		0.957		0.668		0.552		0.108		5.07		5.58		0.166		0.121	

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-6b

Dioxins Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW07S	MW09	MW11	MW12	MW20D	MW20I	MW34D	MW34S	MW36	MW37
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,2,3,4,6,7,8-HpCDD	35822-46-9	pg/L	-	-	-	-	24.9 - 94400	3			94400			24.9 J				
1,2,3,4,6,7,8-HpCDF	67562-39-4	pg/L	-	-	-	-	2.52 - 1200	2			1200			2.52 Z				
1,2,3,4,7,8,9-HpCDF	55673-89-7	pg/L	-	-	-	-	0 - 0	0										
1,2,3,4,7,8-HxCDD	39227-28-6	pg/L	-	-	-	-	0.716 - 248	5			248	1.02 J						
1,2,3,4,7,8-HxCDF	70648-26-9	pg/L	-	-	-	-	0.441 - 3.25	8	0.67 J			3.25 Z			0.441 Z			
1,2,3,6,7,8-HxCDD	57653-85-7	pg/L	-	-	-	-	0.915 - 1920	5			1920	0.956 J						
1,2,3,6,7,8-HxCDF	57117-44-9	pg/L	-	-	-	-	0.366 - 1.62	6				1.62 J			0.366 Z			
1,2,3,7,8,9-HxCDD	19408-74-3	pg/L	-	-	-	-	0.427 - 2490	7			2490	0.427 J						
1,2,3,7,8,9-HxCDF	72918-21-9	pg/L	-	-	-	-	1.07 - 1.4	3										
1,2,3,7,8-PeCDD	40321-76-4	pg/L	-	-	-	-	0 - 0	0										
1,2,3,7,8-PeCDF	57117-41-6	pg/L	-	-	-	-	0 - 0	0										
2,3,4,6,7,8-HxCDF	60851-34-5	pg/L	-	-	-	-	0.724 - 1.46	4				1.46 Z						
2,3,4,7,8-PeCDF	57117-31-4	pg/L	-	-	-	-	0.894 - 0.894	1				0.894 J						
2,3,7,8-TCDD	1746-01-6	pg/L	c	0.12	30	0.12	1.22 - 49.1	2			49.1					1.22 Z		
2,3,7,8-TCDF	51207-31-9	pg/L	-	-	-	-	100 - 100	1			100 J							
OCDD	3268-87-9	pg/L	-	-	-	-	103 - 576000	10			576000			553		122	130	784
OCDF	39001-02-0	pg/L	-	-	-	-	0.916 - 3240	5			3240	4.59 Z			0.916 Z			
Total HpCDD	37871-00-4	pg/L	-	-	-	-	59.1 - 160000	6			160000			61.2				59.1
Total HpCDF	38998-75-3	pg/L	-	-	-	-	2.52 - 4940	2			4940			2.52 Z				
Total HxCDD	34465-46-8	pg/L	-	-	-	-	0.734 - 26200	15	0.736 Z		26200	21.3 Z		11.7	0.734 J		2.19 Z	20.4 J
Total HxCDF	55684-94-1	pg/L	-	-	-	-	0.67 - 1880	11	0.67 J		1880 Z	11.2 Z			0.807 Z			
Total PeCDD	36088-22-9	pg/L	-	-	-	-	0.54 - 2640	7			2640 Z	9.94 Z			0.54 J			1.92 Z
Total PeCDF	30402-15-4	pg/L	-	-	-	-	0.518 - 628	4			628 Z	8.38 Z						
Total TCDD	41903-57-5	pg/L	-	-	-	-	1.22 - 737	7	15.2		737 Z	11.1 Z			23	1.22 Z		
Total TCDF	55722-27-5	pg/L	-	-	-	-	0.592 - 743	4			743 Z	16.2 Z						
Total TEQ - Bird	2222-20-0	pg/L	-	-	-	-	1.41 - 933	19	2.38	1.47	933	4.32	2.44	25.2	1.41	11.9	3.04	3.01
Total TEQ - Fish	2222-21-0	pg/L	-	-	-	-	1.21 - 618	19	2.02	1.21	618	2.93	2.26	16.7	1.22	10.1	2.79	2.8
Total TEQ - Mammal	3333-30-0	pg/L	c	0.12	30	0.12	0 - 1641	19	0.067	0	1641	0.981	0	0.42	0.081	0.128	0.039	0.235

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the assoc
Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-6c

Dioxins and Furans Detected in Landfill Area Groundwater (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW34D		MW34S	
											Result		Result	
1,2,3,4,6,7,8-HpCDD	35822-46-9	-	-	-	-	PG/L	18.4	-	18.4	1			18.4	
1,2,3,4,6,7,8-HpCDF	67562-39-4	-	-	-	-	PG/L	0	-	0	0				
1,2,3,4,7,8,9-HpCDF	55673-89-7	-	-	-	-	PG/L	0	-	0	0				
1,2,3,4,7,8-HxCDD	39227-28-6	-	-	-	-	PG/L	0	-	0	0				
1,2,3,4,7,8-HxCDF	70648-26-9	-	-	-	-	PG/L	0	-	0	0				
1,2,3,6,7,8-HxCDD	57653-85-7	-	-	-	-	PG/L	0	-	0	0				
1,2,3,6,7,8-HxCDF	57117-44-9	-	-	-	-	PG/L	0	-	0	0				
1,2,3,7,8,9-HxCDD	19408-74-3	-	-	-	-	PG/L	0	-	0	0				
1,2,3,7,8,9-HxCDF	72918-21-9	-	-	-	-	PG/L	0	-	0	0				
1,2,3,7,8-PeCDD	40321-76-4	-	-	-	-	PG/L	0	-	0	0				
1,2,3,7,8-PeCDF	57117-41-6	-	-	-	-	PG/L	0.72	-	0.72	1	0.72	J		
2,3,4,6,7,8-HxCDF	60851-34-5	-	-	-	-	PG/L	0	-	0	0				
2,3,4,7,8-PeCDF	57117-31-4	-	-	-	-	PG/L	0	-	0	0				
2,3,7,8-TCDD	1746-01-6	c	0.12	30	0.12	PG/L	0	-	0	0				
2,3,7,8-TCDF	51207-31-9	-	-	-	-	PG/L	0	-	0	0				
OCDD	3268-87-9	-	-	-	-	PG/L	417	-	417	1			417	
OCDF	39001-02-0	-	-	-	-	PG/L	0	-	0	0				
TEQ WHO2005 (mammal)	3333-30-0	c	0.12	30	0.12	PG/L	0.032	-	0.309	2	0.0323		0.309	
Total HpCDD	37871-00-4	-	-	-	-	PG/L	44.1	-	44.1	1			44.1	
Total HpCDF	38998-75-3	-	-	-	-	PG/L	0	-	0	0				
Total HxCDD	34465-46-8	-	-	-	-	PG/L	3.98	-	3.98	1			3.98	
Total HxCDF	55684-94-1	-	-	-	-	PG/L	2.8	-	2.8	1			2.8	
Total PeCDD	36088-22-9	-	-	-	-	PG/L	1.08	-	1.08	1	1.08			
Total PeCDF	30402-15-4	-	-	-	-	PG/L	0.711	-	0.711	1	0.711	J		
Total TCDD	41903-57-5	-	-	-	-	PG/L	38.7	-	38.7	1	38.7			
Total TCDF	55722-27-5	-	-	-	-	PG/L	3.12	-	3.12	1	3.12			
Total TEQ Bird	2222-20-0	-	-	-	-	PG/L	3.28	-	3.92	2	3.28		3.92	
Total TEQ Fish	2222-21-0	-	-	-	-	PG/L	2.74	-	3.32	2	2.74		3.32	

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-7a

Anions, Dissolved Gas, and PFCs Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Methane	74-82-8	mg/l	-	-	-	-	0.027	-	394	20	27.7		34.3		5.35		78.1		394		28.8		37.3		121		0.11		8.44	
Nitrate	14797-55-8	mg/l	n	3.2	10	3.2	0.15	-	0.15	6	0.15		0.15		0.15		0.15				0.15		0.15							
Nitrite	14797-65-0	mg/l	n	0.2	1	0.2	0.05	-	2.5	6	2.5		0.05		0.5		0.5				2		1							
Sulfate	14808-79-8	mg/l	-	-	-	-	0.5	-	80.2	15	3.45		0.5		6.31		0.5				0.5		0.526				5.34			
Perfluorobutanesulfonic Acid	375-73-5	ug/l	-	-	-	0.2	0	-	0	0																				
Perfluoroheptanoic acid	375-85-9	ug/l	-	-	-	-	0.011	-	0.27	18	0.054	J			0.055		0.081		0.27	J	0.091	J	0.2		0.067	J	0.067	J	0.041	J
Perfluorohexanesulfonic Acid	355-46-4	ug/l	-	-	-	-	0.022	-	0.2	10	0.086	J			0.062	J	0.084	J	0.2	J					0.051	J	0.037	J	0.025	J
Perfluorononanoic Acid	375-95-1	ug/l	-	-	-	-	0.011	-	0.16	7			0.16	J					0.054	J									0.011	J
Perfluorooctanesulfonic Acid	1763-23-1	ug/l	-	-	-	0.04	0.02	-	1.2	14	0.02	J	1.2		0.25		0.11	J	0.96	J			0.16	J	0.17	J	0.13	J	0.07	J
Perfluorooctanoic Acid	335-67-1	ug/l	-	-	-	0.04	0.026	-	0.56	20	0.14	J	0.37		0.17		0.22		0.55	J	0.19	J	0.56		0.28	J	0.22	J	0.16	J

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-7a

Anions, Dissolved Gas, and PFCs Detected in Landfill Area Groundwater (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW09		MW11		MW12		MW20D		MW20D-DUP		MW20I		MW20S		MW34D		MW34S		MW36		MW37	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Methane	74-82-8	mg/l	-	-	-	-	0.027	-	394	20	4.52		53.3		34.1		0.307		NA		0.0266		1.36		3.93		330		20		18.3	
Nitrate	14797-55-8	mg/l	n	3.2	10	3.2	0.15	-	0.15	6									NA													
Nitrite	14797-65-0	mg/l	n	0.2	1	0.2	0.05	-	2.5	6									NA													
Sulfate	14808-79-8	mg/l	-	-	-	-	0.5	-	80.2	15	2.96		1.99				39		NA		80.2		59		14.8		0.689				0.518	
Perfluorobutanesulfonic Acid	375-73-5	ug/l	-	-	-	0.2	0	-	0	0																						
Perfluoroheptanoic acid	375-85-9	ug/l	-	-	-	-	0.011	-	0.27	18	0.016		0.094		0.19	J	0.016		0.014				0.023		0.011	J	0.03	J	0.055	J	0.13	J
Perfluorohexanesulfonic Acid	355-46-4	ug/l	-	-	-	-	0.022	-	0.2	10			0.022	J	0.12	J											0.031	J				
Perfluorononanoic Acid	375-95-1	ug/l	-	-	-	-	0.011	-	0.16	7	0.02		0.012	J	0.017	J											0.018	J				
Perfluorooctanesulfonic Acid	1763-23-1	ug/l	-	-	-	0.04	0.02	-	1.2	14			0.064		0.24	J											0.15	J	0.26	J	0.21	J
Perfluorooctanoic Acid	335-67-1	ug/l	-	-	-	0.04	0.026	-	0.56	20	0.046		0.35		0.47	J	0.046		0.046				0.074		0.026	J	0.16	J	0.17	J	0.34	J

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less t

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednu

Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-7b

Anions and Dissolved Gas Detected in Landfill Area Groundwater (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S		MW09		MW11		MW12	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Nitrate	14797-55-8	n	3.2	10	3.2	MG/L	0	-	0	0																						
Nitrite	14797-65-0	n	0.2	1	0.2	MG/L	0	-	0	0																						
Sulfate	14808-79-8	-	-	-	-	MG/L	0.52	-	49.1	10	14.3				0.536				0.659				4.45						1.14			
Acetylene	74-86-2	-	-	-	-	UG/L	65.7	-	8580	11	NA		NA		4060		NA		NA		NA		74.3		2490		NA		4250		NA	
Methane	74-82-8	-	-	-	-	UG/L	20	-	21000	18	2600		21000		18000		12000	J	13000		14000		290	J	4900		2700		8300		15000	

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-7b

Anions and Dissolved Gas Detected in Landfill Area Groundwater (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	MW20D		MW20I		MW20S		MW34D		MW34S		MW36		MW37	
							Result		Result		Result		Result		Result		Result		Result	
Nitrate	14797-55-8	n	3.2	10	3.2	MG/L														
Nitrite	14797-65-0	n	0.2	1	0.2	MG/L														
Sulfate	14808-79-8	-	-	-	-	MG/L	34.4		49.1		41.4		10.1						0.52	
Acetylene	74-86-2	-	-	-	-	UG/L	69.9		65.7		466		471		8580		2330		5710	
Methane	74-82-8	-	-	-	-	UG/L	130		20		1000		740		15000		4300		14000	

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-7c

Anions and Dissolved Gas Detected in Landfill Area Groundwater (April 2016)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW01D		MW01S		MW02		MW03		MW04		MW05D		MW05S		MW06		MW07D		MW07S		MW09	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Acetylene	74-86-2	-	-	-	-	UG/L	53.6	-	81.4	16	81.4		74.7		73.8		72.4		65.8		67.8		71		68.9		66.6		73.2		71.2	
Methane	74-82-8	-	-	-	-	UG/L	51	-	20000	16	2200		20000		3000		18000		14000		16000	J	12000		15000		51		6400		1100	
Sulfate	14808-79-8	-	-	-	-	MG/L	2.24	-	9.8	4	5.78				9.8		NA		NA						NA		5.72				2.24	

* USEPA Region III Regional Screening Level (RSL), May 2016

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-7c

Anions and Dissolved Gas Detected in Landfill Area Groundwater (April 2016)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	MW11		MW34D		MW34S		MW36		MW37	
							Result		Result		Result		Result		Result	
Acetylene	74-86-2	-	-	-	-	UG/L	59.1		53.6		58.6		58.1		57.3	
Methane	74-82-8	-	-	-	-	UG/L	8100		680		16000		6000		12000	
Sulfate	14808-79-8	-	-	-	-	MG/L	NA		NA		NA		NA		NA	

* USEPA Region III Regional Screening Level (RSL), May 2016
** Pennsylvania Maximum Contaminant Levels
Highlighted concentrations are over Project Screening Levels

Table 4-8a
Inorganics Detected in Shallow Groundwater -Outside Landfill Boundary (March 2014)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Fraction	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW08		MW13S		MW14S		MW15S		MW16S		MW17S		MW17S-DUP		MW18S		MW26D		MW26S		MW27		MW28		MW29		MW30	
										Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Aluminum	Dissolved	7429-90-5	UG/L	n	2000	-	2000	21.3 - 21.3	1															21.3	J												
Antimony	Dissolved	7440-36-0	UG/L	n	0.78	6	0.78	0 - 0	0																												
Arsenic	Dissolved	7440-38-2	UG/L	c	0.052	10	0.052	2.1 - 58.8	8					11.7		39.3		2.1								7.9				10.4							
Barium	Dissolved	7440-39-3	UG/L	n	380	2000	380	34.4 - 1100	31	149		95.3		149		120		537		51.4		50.4		34.4		237		1100		476		140		80.9		83.2	
Beryllium	Dissolved	7440-41-7	UG/L	n	2.5	4	2.5	0 - 0	0																												
Boron	Dissolved	7440-42-8	UG/L	n	400	-	400	33.1 - 1600	31	162	J	165	J	297	J	527		1600		35.5		33.1		35.1		48.6		108		603		819		71.3		373	
Cadmium	Dissolved	7440-43-9	UG/L	n	0.92	5	0.92	0.094 - 2.3	6	0.22	J															0.18	J										
Calcium	Dissolved	7440-70-2	UG/L	-	-	-	-	25500 - 141000	31	133000		36600		141000		71100		82400		31700		30900		25500		32000		85800		71300		57400		44400		54800	
Chromium	Dissolved	7440-47-3	UG/L	c	0.035	100	0.035	0.7 - 6.2	28	2.4	J			2.5	J	3	J	4.2	J	3.7	J	4.9	J	1.4	J	2.3	J			4.3	J	1.3	J	3.3	J	1.1	J
Cobalt	Dissolved	7440-48-4	UG/L	n	0.6	-	0.6	1.3 - 55.1	29	21.2		6.3		28.2		12.9		19.7		1.4		1.3		4.3		16		4.6		5.7		9.4				5.2	
Copper	Dissolved	7440-50-8	UG/L	n	80	1300	80	2.1 - 39.4	26	2.4	J	4.7	J			5.8		12.8		2.4				4		5.4		2.1		4.6		17.9		2.2		4.5	
Iron	Dissolved	7439-89-6	UG/L	n	1400	-	1400	57.1 - 64500	24	9440	J			22200	J	38800		25200						61.8	J	44500		42300		16700		217		97.3	J	132	J
Lead	Dissolved	7439-92-1	UG/L	L	-	15	15	0.41 - 45.7	14							0.83	J	0.71	J	0.41	J	0.45	J	2		45.7		11									
Magnesium	Dissolved	7439-95-4	UG/L	-	-	-	-	11300 - 94100	31	31100		15300		94100		52200		60400		15800		15600		11300		25700		11600		39100		42000		24100		35500	
Manganese	Dissolved	7439-96-5	UG/L	n	43	-	43	24.9 - 73400	31	683		1090		4290		641	J	1310	J	32.1	J	24.9	J	1320	J	4090	J	273	J	2300	J	20000	J	65.3	J	802	J
Mercury	Dissolved	7439-97-6	UG/L	n	0.063	2	0.063	0 - 0	0																												
Nickel	Dissolved	7440-02-0	UG/L	n	39	-	39	2.2 - 31.9	31	3.8		2.2		6.5		6.9		17.3		4.8		3.8		4.7		5.2		2.6		25		17.5		4.3		9.1	
Potassium	Dissolved	7440-09-7	UG/L	-	-	-	-	2750 - 39800	31	9010		9660		13000		22300		39800		2860		2750		4560		5630		5360		26700		24900		5200		8140	
Selenium	Dissolved	7782-49-2	UG/L	n	10	50	10	0.56 - 10.3	4									0.56	J							0.76	J										
Silver	Dissolved	7440-22-4	UG/L	n	9.4	-	9.4	0.054 - 0.093	6	0.071	J			0.083	J																						
Sodium	Dissolved	7440-23-5	UG/L	-	-	-	-	7570 - 351000	31	16700		50400		30200		96200		222000		15300		14300		18400		97700		7570		36800		193000		93400		145000	
Thallium	Dissolved	7440-28-0	UG/L	n	0.02	2	0.02	0 - 0	0																												
Vanadium	Dissolved	7440-62-2	UG/L	n	8.6	-	8.6	0.14 - 5.6	5							0.37	J	0.87	J							0.14	J	0.35	J								
Zinc	Dissolved	7440-66-6	UG/L	n	600	-	600	3.9 - 38.4	31	24.2		3.9		7.4		22	J	17.9	J	13	J	9.8	J	27.4	J	33.4	J	19.3	J	28.6	J	7.9	J	12.6	J	22.5	J
Aluminum	Total	7429-90-5	UG/L	n	2000	-	2000	2.8 - 981	15	56.8		44.6		70.8		2.8	J	12.8	J	4.1	J	6	J	23.5	J	981		14.5	J	41.7	J						
Antimony	Total	7440-36-0	UG/L	n	0.78	6	0.78	5.3 - 5.3	1	5.3																											
Arsenic	Total	7440-38-2	UG/L	c	0.052	10	0.052	0.16 - 54.3	14	20.8		0.16	J	11		38.8	J	2.2	J							7.3	J			10.8							
Barium	Total	7440-39-3	UG/L	n	380	2000	380	35.4 - 1110	31	306		99.6		142		111	J	437	J	52.3	J	52.6	J	35.4		235	J	1110	J	497		133		82.9		77.6	
Beryllium	Total	7440-41-7	UG/L	n	2.5	4	2.5	0.072 - 0.072	1																	0.072	J										
Boron	Total	7440-42-8	UG/L	n	400	-	400	33.9 - 1380	31	180		185		307		488		1380		35.9		34.6		38.4		47.1		114		587		779		72		350	
Cadmium	Total	7440-43-9	UG/L	n	0.92	5	0.92	0.096 - 2.7	9	2.7														0.2	J							0.86	J				
Calcium	Total	7440-70-2	UG/L	-	-	-	-	27400 - 152000	31	146000		37300		152000		69600		75000		31200		31700		27400	J	30300		88300		74700	J	57000	J	46200	J	52600	J
Chromium	Total	7440-47-3	UG/L	c	0.035	100	0.035	2.3 - 7.4	21	5.2						2.4	J	7.4	J	4.8	J	3.9	J	3.6	J	6.2	J	2.3	J							2.6	J
Cobalt	Total	7440-48-4	UG/L	n	0.6	-	0.6	1.4 - 53.3	31	24.1		6.6		9.7		6.5		16.5		1.4		1.4		6.1		15.1		4.4		9.5		12.1		2.4		7.4	
Copper	Total	7440-50-8	UG/L	n	80	1300	80	2.1 - 31.2	20	21.5		4.4				5.9		10.9						2.6		9.6		3.1		3.2		16.6		2.5		3.5	
Cyanide	Total	57-12-5	UG/L	n	0.15	200	0.15	0.91 - 3.3	10	1.6	J	0.99	J	3.3	J																						
Iron	Total	7439-89-6	UG/L	n	1400	-	1400	70 - 62400	22	38500	J	327	J	20000	J	38300	J	21200	J	81.7	J	70	J			43600	J	42500	J	18400	J	235	J				
Lead	Total	7439-92-1	UG/L	L	-	15	15	0.31 - 51.6	22	51.6						1.7	J	0.98	J	0.4	J	1	J	0.92	J	5.3	J	2.1	J	1.3		0.57	J	1.9		0.55	J
Magnesium	Total	7439-95-4	UG/L	-	-	-	-	11700 - 84700	31	34200		14900		84700		46900		51400		15400		15900		13400		24100		11700		43900		45300		27200		37500	
Manganese	Total	7439-96-5	UG/L	n	43	-	43	32.3 - 67200	31	790		1130		3890		618		1420		32.9		32.3		1400	J	3840		277		2310	J	20100	J	59.6	J	738	J
Mercury	Total	7439-97-6	UG/L	n	0.063	2	0.063	0 - 0	0																												
Nickel	Total	7440-02-0	UG/L	n	39	-	39	2.3 - 31.2	31	4.7		2.6		5.4		10.5		10.9		2.3		3.4		4.8	J	11.3		4.3		4	J	16.2	J	5.3	J	8	J
Potassium	Total	7440-09-7	UG/L	-	-	-	-	2830 - 34300	31	10100		9730		11800		21500		34300		2830		2850		4840		5460		5460		28100		24700		5500		7810	
Selenium	Total	7782-49-2	UG/L	n	10	50	10	0.53 - 9.7	12					1	J			0.76	J							0.57	J			0.55	J	3.6	J	0.53	J	1.5	J
Silver	Total	7440-22-4	UG/L	n	9.4	-	9.4	0 - 0	0																												
Sodium	Total	7440-23-5	UG/L	-	-	-	-	7920 - 338000	31	18400		50900		27100		87500		180000		14900		14900		23700		92300		7920		41100		207000		108000		158000	
Thallium	Total	7440-28-0	UG/L	n	0.02	2	0.02	0 - 0	0																												
Vanadium	Total	7440-62-2	UG/L	n	8.6	-	8.6	0.19 - 7.6	9	7.6	J			0.19	J	0.26	J	0.53	J							3.7	J	0.55	J	0.63	J	0.29	J				
Zinc	Total	7440-66-6	UG/L	n	600	-	600	4.3 - 177	29	177		4.6		4.3		13	J	18.3	J	8.6	J	4.8	J	12.1	J	46.7	J	27.2	J	30.3	J	5.8	J	11.4	J	17.6	J

Table 4-8a

Inorganics Detected in Shallow Groundwater -Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Fraction	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW31		MW32		MW33		MW35		MW38		MW39		MW40		MW41D		MW41D-DUP		MW41S		MW42		MW43		MW44		MW45	
										Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Aluminum	Dissolved	7429-90-5	UG/L	n	2000	-	2000	21.3 - 21.3	1																												
Antimony	Dissolved	7440-36-0	UG/L	n	0.78	6	0.78	0 - 0	0																												
Arsenic	Dissolved	7440-38-2	UG/L	c	0.052	10	0.052	2.1 - 58.8	8															2.8		2.4		58.8									
Barium	Dissolved	7440-39-3	UG/L	n	380	2000	380	34.4 - 1100	31	42.3		99.7		57.9		63.1		348		43.3		118		471		458		220		117		101		79.5		84.2	
Beryllium	Dissolved	7440-41-7	UG/L	n	2.5	4	2.5	0 - 0	0																												
Boron	Dissolved	7440-42-8	UG/L	n	400	-	400	33.1 - 1600	31	113		461		71		99.1		978		106	J	37.4		191		177		61.6	J	109		272		84.3		411	J
Cadmium	Dissolved	7440-43-9	UG/L	n	0.92	5	0.92	0.094 - 2.3	6															2.1		2.3				0.094	J			0.097	J		
Calcium	Dissolved	7440-70-2	UG/L	-	-	-	-	25500 - 141000	31	54300		54500		49800	J	51900		108000	J	54500		27000		88500	J	84800	J	69200		50700	J	44100		59900	J	53200	
Chromium	Dissolved	7440-47-3	UG/L	c	0.035	100	0.035	0.7 - 6.2	28	3	J	3.5	J	4		0.7	J	3.5		4.7	J	3.3	J	2.1		2.7				1.6	J	3.6	J	4.4		3.4	J
Cobalt	Dissolved	7440-48-4	UG/L	n	0.6	-	0.6	1.3 - 55.1	29	5.6		1.5		7.8	J	8.6		12.9	J	9.3		5.7		55.1	J	52.6	J			3.6	J	4.4		3.6	J	8.7	
Copper	Dissolved	7440-50-8	UG/L	n	80	1300	80	2.1 - 39.4	26			5.2		3.6				12.8		2.4	J	2.8		39.4		37.7		5.5	J	3.9				3.4		3.6	J
Iron	Dissolved	7439-89-6	UG/L	n	1400	-	1400	57.1 - 64500	24	303		110	J	299		156	J	3330		265	J	57.1	J	691		659		64500	J			965		3540			
Lead	Dissolved	7439-92-1	UG/L	L	-	15	15	0.41 - 45.7	14					0.97	J			0.71	J					0.46	J	0.8	J			0.41	J			0.68	J		
Magnesium	Dissolved	7439-95-4	UG/L	-	-	-	-	11300 - 94100	31	34300		37400		30500		30000		54900		38300		22400		59500		57500		29200		21500		27000		35000		32300	
Manganese	Dissolved	7439-96-5	UG/L	n	43	-	43	24.9 - 73400	31	1140	J	121	J	1740		4060	J	6070		249		1150	J	73400		5410		4860		2060		2710	J	11700		515	
Mercury	Dissolved	7439-97-6	UG/L	n	0.063	2	0.063	0 - 0	0																												
Nickel	Dissolved	7440-02-0	UG/L	n	39	-	39	2.2 - 31.9	31	11.3		8.2		8.7		9.2		9.2		4.9		13.1		31.9		31.2		2.4		4.5		8.3		6.4		4.1	
Potassium	Dissolved	7440-09-7	UG/L	-	-	-	-	2750 - 39800	31	11900		12200		11100		6560		25800		6140		3570		12700		12200		8460		6620		8200		7560		10100	
Selenium	Dissolved	7782-49-2	UG/L	n	10	50	10	0.56 - 10.3	4															10.3		8.4											
Silver	Dissolved	7440-22-4	UG/L	n	9.4	-	9.4	0.054 - 0.093	6											0.054	J							0.054	J							0.093	J
Sodium	Dissolved	7440-23-5	UG/L	-	-	-	-	7570 - 351000	31	53200		156000		44600		49300		184000		98700		66100		351000		342000		171000		59200		78200		63700		82800	
Thallium	Dissolved	7440-28-0	UG/L	n	0.02	2	0.02	0 - 0	0																												
Vanadium	Dissolved	7440-62-2	UG/L	n	8.6	-	8.6	0.14 - 5.6	5																												
Zinc	Dissolved	7440-66-6	UG/L	n	600	-	600	3.9 - 38.4	31	38.4	J	11.3	J	31.1	J	11.4	J	10.3	J	9.3		22.8	J	14.2	J	15	J	7.2		25.9	J	15.9	J	12.6	J	4.9	
Aluminum	Total	7429-90-5	UG/L	n	2000	-	2000	2.8 - 981	15									24.4				27.7	J							21.2						119	
Antimony	Total	7440-36-0	UG/L	n	0.78	6	0.78	5.3 - 5.3	1																												
Arsenic	Total	7440-38-2	UG/L	c	0.052	10	0.052	0.16 - 54.3	14											0.18	J			2.6		2		54.3						1.2		0.3	J
Barium	Total	7440-39-3	UG/L	n	380	2000	380	35.4 - 1110	31	43.2		99.3		56.2		61.5		353		42.5		115		459		462		216		120		104		78.1		81.3	
Beryllium	Total	7440-41-7	UG/L	n	2.5	4	2.5	0.072 - 0.072	1																												
Boron	Total	7440-42-8	UG/L	n	400	-	400	33.9 - 1380	31	109		452		65.2		101		1310		120		33.9		180		182		65.3		109		269		81.3		401	
Cadmium	Total	7440-43-9	UG/L	n	0.92	5	0.92	0.096 - 2.7	9											0.096	J			2.2		2.2						0.67	J			0.14	J
Calcium	Total	7440-70-2	UG/L	-	-	-	-	27400 - 152000	31	55400	J	55100	J	49100	J	52400	J	113000	J	53300		27400	J	84100	J	87200	J	68800	J	51000	J	45800	J	57000	J	50600	
Chromium	Total	7440-47-3	UG/L	c	0.035	100	0.035	2.3 - 7.4	21	3.7	J	2.3	J	6.3	J	2.7	J	6.8	J	4.8		5.5	J	3.7	J	3.7	J					2.7	J				
Cobalt	Total	7440-48-4	UG/L	n	0.6	-	0.6	1.4 - 53.3	31	8.6		4.6		7.8		11.1		13		9.3		6.9		52.2		53.3		1.6		3.6		7		3.5		8.5	
Copper	Total	7440-50-8	UG/L	n	80	1300	80	2.1 - 31.2	20			4.6				3.7		13.4				2.1		29.1		31.2		8.7								3.5	
Cyanide	Total	57-12-5	UG/L	n	0.15	200	0.15	0.91 - 3.3	10											0.97	J			0.97	J-	0.91	J-	1.8	J							1.4	J
Iron	Total	7439-89-6	UG/L	n	1400	-	1400	70 - 62400	22	323	J			319				3400		323	J			696		706		62400				1020	J	3660		392	J
Lead	Total	7439-92-1	UG/L	L	-	15	15	0.31 - 51.6	22	1.1		0.31	J			0.54	J	0.54	J			0.88	J	0.95	J	0.58	J	4.2	J			0.49	J				
Magnesium	Total	7439-95-4	UG/L	-	-	-	-	11700 - 84700	31	38000		41100		29800		33600		57000		36200		23900		58600		59900		27900		21600		30200		33800		30600	
Manganese	Total	7439-96-5	UG/L	n	43	-	43	32.3 - 67200	31	1140	J	106	J	1670		4050	J	6320		236		1140	J	67200		127	J	5140		2080		2680	J	11000		509	
Mercury	Total	7439-97-6	UG/L	n	0.063	2	0.063	0 - 0	0																												
Nickel	Total	7440-02-0	UG/L	n	39	-	39	2.3 - 31.2	31	12.5	J	7.2	J	9	J	8.4	J	8.6	J	5.1		12.4	J	30	J	31.2	J	5.7	J	4.5	J	8	J	3.4	J	5.2	
Potassium	Total	7440-09-7	UG/L	-	-	-	-	2830 - 34300	31	12300		12300		11100		6690		26400		5950		3590		12300		12600		9200		6640		8550		7240		9580	
Selenium	Total	7782-49-2	UG/L	n	10	50	10	0.53 - 9.7	12	1.7	J	1.1	J											9.7		8						0.56	J				
Silver	Total	7440-22-4	UG/L	n	9.4	-	9.4	0 - 0	0																												
Sodium	Total	7440-23-5	UG/L	-	-	-	-	7920 - 338000	31	59100		172000		43300		54900		191000		93300		70900		331000		338000		158000		59200		85800		60900		82700	
Thallium	Total	7440-28-0	UG/L	n	0.02	2	0.02	0 - 0	0																												
Vanadium	Total	7440-62-2	UG/L	n	8.6	-	8.6	0.19 - 7.6	9	0.39	J																										
Zinc	Total	7440-66-6	UG/L	n	600	-	600	4.3 - 177	29	39	J	5.2	J	25.3		8.7	J	7.6		7		19.1	J	14.1		14.7		8.5		4.9		11.5	J	8.7		7.7	

Table 4-8a

Inorganics Detected in Shallow Groundwater -Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Fraction	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW46		MW47		MW47-DUP	
										Result	Flag	Result	Flag	Result	Flag
Aluminum	Dissolved	7429-90-5	UG/L	n	2000	-	2000	21.3 - 21.3	1						
Antimony	Dissolved	7440-36-0	UG/L	n	0.78	6	0.78	0 - 0	0						
Arsenic	Dissolved	7440-38-2	UG/L	c	0.052	10	0.052	2.1 - 58.8	8						
Barium	Dissolved	7440-39-3	UG/L	n	380	2000	380	34.4 - 1100	31	92.1		46.8		47.3	
Beryllium	Dissolved	7440-41-7	UG/L	n	2.5	4	2.5	0 - 0	0						
Boron	Dissolved	7440-42-8	UG/L	n	400	-	400	33.1 - 1600	31	513		282	J	284	J
Cadmium	Dissolved	7440-43-9	UG/L	n	0.92	5	0.92	0.094 - 2.3	6						
Calcium	Dissolved	7440-70-2	UG/L	-	-	-	-	25500 - 141000	31	71300		44900		45700	
Chromium	Dissolved	7440-47-3	UG/L	c	0.035	100	0.035	0.7 - 6.2	28	1	J	6.2	J	5.2	J
Cobalt	Dissolved	7440-48-4	UG/L	n	0.6	-	0.6	1.3 - 55.1	29	4.2		7.2		7.3	
Copper	Dissolved	7440-50-8	UG/L	n	80	1300	80	2.1 - 39.4	26	7.4		2.8	J	2.6	J
Iron	Dissolved	7439-89-6	UG/L	n	1400	-	1400	57.1 - 64500	24	283					
Lead	Dissolved	7439-92-1	UG/L	L	-	15	15	0.41 - 45.7	14	3					
Magnesium	Dissolved	7439-95-4	UG/L	-	-	-	-	11300 - 94100	31	37700		32400		33100	
Manganese	Dissolved	7439-96-5	UG/L	n	43	-	43	24.9 - 73400	31	6560	J	44.7		45.2	
Mercury	Dissolved	7439-97-6	UG/L	n	0.063	2	0.063	0 - 0	0						
Nickel	Dissolved	7440-02-0	UG/L	n	39	-	39	2.2 - 31.9	31	6.4		5.2		4.3	
Potassium	Dissolved	7440-09-7	UG/L	-	-	-	-	2750 - 39800	31	14300		9360		9500	
Selenium	Dissolved	7782-49-2	UG/L	n	10	50	10	0.56 - 10.3	4						
Silver	Dissolved	7440-22-4	UG/L	n	9.4	-	9.4	0.054 - 0.093	6					0.079	J
Sodium	Dissolved	7440-23-5	UG/L	-	-	-	-	7570 - 351000	31	118000		88500		90400	
Thallium	Dissolved	7440-28-0	UG/L	n	0.02	2	0.02	0 - 0	0						
Vanadium	Dissolved	7440-62-2	UG/L	n	8.6	-	8.6	0.14 - 5.6	5			5.6			
Zinc	Dissolved	7440-66-6	UG/L	n	600	-	600	3.9 - 38.4	31	6.1	J	8.2		4.6	
Aluminum	Total	7429-90-5	UG/L	n	2000	-	2000	2.8 - 981	15						
Antimony	Total	7440-36-0	UG/L	n	0.78	6	0.78	5.3 - 5.3	1						
Arsenic	Total	7440-38-2	UG/L	c	0.052	10	0.052	0.16 - 54.3	14					0.29	J
Barium	Total	7440-39-3	UG/L	n	380	2000	380	35.4 - 1110	31	92.3		45.2		47.6	
Beryllium	Total	7440-41-7	UG/L	n	2.5	4	2.5	0.072 - 0.072	1						
Boron	Total	7440-42-8	UG/L	n	400	-	400	33.9 - 1380	31	503		283		299	
Cadmium	Total	7440-43-9	UG/L	n	0.92	5	0.92	0.096 - 2.7	9	0.28	J				
Calcium	Total	7440-70-2	UG/L	-	-	-	-	27400 - 152000	31	72500	J	43600		45700	
Chromium	Total	7440-47-3	UG/L	c	0.035	100	0.035	2.3 - 7.4	21			3.3		4.9	
Cobalt	Total	7440-48-4	UG/L	n	0.6	-	0.6	1.4 - 53.3	31	8.1		7		7.4	
Copper	Total	7440-50-8	UG/L	n	80	1300	80	2.1 - 31.2	20	4					
Cyanide	Total	57-12-5	UG/L	n	0.15	200	0.15	0.91 - 3.3	10			2	J	1.6	J
Iron	Total	7439-89-6	UG/L	n	1400	-	1400	70 - 62400	22	310	J				
Lead	Total	7439-92-1	UG/L	L	-	15	15	0.31 - 51.6	22	0.47	J				
Magnesium	Total	7439-95-4	UG/L	-	-	-	-	11700 - 84700	31	41600		31000		32400	
Manganese	Total	7439-96-5	UG/L	n	43	-	43	32.3 - 67200	31	6580	J	41.3		43.8	
Mercury	Total	7439-97-6	UG/L	n	0.063	2	0.063	0 - 0	0						
Nickel	Total	7440-02-0	UG/L	n	39	-	39	2.3 - 31.2	31	5.6	J	3.6		5.4	
Potassium	Total	7440-09-7	UG/L	-	-	-	-	2830 - 34300	31	14500		8970		9400	
Selenium	Total	7782-49-2	UG/L	n	10	50	10	0.53 - 9.7	12						
Silver	Total	7440-22-4	UG/L	n	9.4	-	9.4	0 - 0	0						
Sodium	Total	7440-23-5	UG/L	-	-	-	-	7920 - 338000	31	131000		85000		90100	
Thallium	Total	7440-28-0	UG/L	n	0.02	2	0.02	0 - 0	0						
Vanadium	Total	7440-62-2	UG/L	n	8.6	-	8.6	0.19 - 7.6	9						
Zinc	Total	7440-66-6	UG/L	n	600	-	600	4.3 - 177	29	6	J				

Table 4-8b

Inorganics Detected in Shallow Groundwater -Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Type	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW08	MW13S	MW14S	MW15S	MW16S	MW17S	MW17S-DUP	MW18S	MW25	MW26D	MW26S	MW27	MW28	MW29	MW30
										Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Aluminum	Total	7429-90-5	ug/L	n	2000	-	2000	2.8 - 1660	9	7.2 J			1660		2.8 J				212				27.7	
Antimony	Total	7440-36-0	ug/L	n	0.78	6	0.78	0.13 - 0.13	1															
Arsenic	Total	7440-38-2	ug/L	c	0.052	10	0.052	0.12 - 51.3	18	2.7	0.66	16.6	51.3		0.13 J	0.12 J	0.25 J		11.3		14.6	0.69		
Barium	Total	7440-39-3	ug/L	n	380	2000	380	33.1 - 1220	30	205	271	197	123 J	232 J	58.3	57.4	39	533 J	230	1220	525	166	68.4	74.6
Beryllium	Total	7440-41-7	ug/L	n	2.5	4	2.5	0.084 - 0.084	1				0.084 J											
Boron	Total	7440-42-8	ug/L	n	400	-	400	28.9 - 2920	25	204	222	392	346	1100	28.9 J-	28.9 J-		2920		119	646	956		191
Cadmium	Total	7440-43-9	ug/L	n	0.92	5	0.92	0.033 - 2.2	11	0.24 J	0.1 J					0.033 J	0.28 J					1.1		
Calcium	Total	7440-70-2	ug/L	-	-	-	-	17300 - 197000	29	171000	87800	197000	77400	33300	29200	28900	26400	26300	25300	91300	79000	68800	49300	53600
Chromium	Total	7440-47-3	ug/L	-	0.035	100	0.035	0.24 - 4.7	16	0.34 J			4.7 J	3 J	0.34 J	0.32 J		1.1 J						
Cobalt	Total	7440-48-4	ug/L	n	0.6	-	0.6	1.2 - 66.1	11		4.6	8					5.2 J-		11.7		6.8	9.8		
Copper	Total	7440-50-8	ug/L	n	80	1300	80	0.14 - 9	21	7.3 J	5.7	0.38 J	7.9 J	3.1 J	0.41 J		0.14 J-	2.8 J	0.2 J	0.38 J		9	0.26 J	1.1 J
Cyanide	Total	57-12-5	ug/L	n	0.15	200	0.15	1.1 - 1.3	2				1.1 J-											
Iron	Total	7439-89-6	ug/L	n	1400	-	1400	132 - 53400	17	19600		25300	53400	18800				5160	38400	41300	17000			
Lead	Total	7439-92-1	ug/L	L	-	15	15	0.35 - 19.8	3	4.5								19.8						
Magnesium	Total	7439-95-4	ug/L	-	-	-	-	10800 - 105000	30	25800	36900	105000	50700	42400	15600	15500	13100	76900	19100	10800	45300	51400	25100	35400
Manganese	Total	7439-96-5	ug/L	n	43	-	43	2.5 - 71800	30	625	3970	6260	920	1220	4.9	4.8	1560	555	2740	337	2360	21400	2.5	92.9
Mercury	Total	7439-97-6	ug/L	n	0.063	2	0.063	0.015 - 0.12	7	0.041 J-			0.028 J-	0.027 J-										
Nickel	Total	7440-02-0	ug/L	n	39	-	39	1.1 - 32	30	1.8	3.2	6.1 J	1.3 J	6.8 J	1.3	1.2	3.2	3.3 J	3.6 J	1.1 J	3.6 J	17.9	1.1 J	2.7 J
Potassium	Total	7440-09-7	ug/L	-	-	-	-	2360 - 53800	27	9270	16400	15300	25900	37100	2370	2360	5050	53800	5170	6670	32100	32300	5410	11000
Selenium	Total	7782-49-2	ug/L	n	10	50	10	0.41 - 3.5	7			0.64 J												0.7 J
Silver	Total	7440-22-4	ug/L	n	9.4	-	9.4	0 - 0	0															
Sodium	Total	7440-23-5	ug/L	-	-	-	-	6640 - 3E+06	30	14900	129000	36400	2430000	2280000	12200	11900	20500	2620000	96700	6640	37600	261000	73000	91200
Thallium	Total	7440-28-0	ug/L	n	0.02	2	0.02	3.9 - 3.9	1															
Vanadium	Total	7440-62-2	ug/L	n	8.6	-	8.6	0.26 - 5.9	16		0.74 J-	0.52 J-	5.9 J	0.67 J					0.99 J		0.64 J-	0.27 J-		0.26 J-
Zinc	Total	7440-66-6	ug/L	n	600	-	600	2 - 18.8	20	18.8 J	6	5.1 J			4.7 J	2.3 J	5.8		7.2 J	4.1 J	3.9 J			3.5 J
Aluminum	Dissolved	7429-90-5	ug/L	n	2000	-	2000	2.8 - 3.6	2						2.8 J	3.6 J								
Antimony	Dissolved	7440-36-0	ug/L	n	0.78	6	0.78	2 - 2	1				2 J-											
Arsenic	Dissolved	7440-38-2	ug/L	c	0.052	10	0.052	0.15 - 49.2	26	1.2	0.6	15.9	49.2	2.1 J	0.17 J	0.15 J	0.24 J	2.8 J	11.3	0.46 J	14.2	0.64	0.16 J	0.18 J
Barium	Dissolved	7440-39-3	ug/L	n	380	2000	380	37.9 - 1130	26	207	272	170		386	59.9	60.6	37.9	415	206	1130	461	155	61.7	66.2
Beryllium	Dissolved	7440-41-7	ug/L	n	2.5	4	2.5	0.052 - 0.052	1								0.052 J							
Cadmium	Dissolved	7440-43-9	ug/L	n	0.92	5	0.92	0.029 - 2.2	6	0.029 J					0.046 J	0.031 J								
Calcium	Dissolved	7440-70-2	ug/L	-	-	-	-	17400 - 278000	30	160000	91900	194000	85600	72900	29600	30800	26500	26900	24800	89700	78000	66400	50200	55300
Chromium	Dissolved	7440-47-3	ug/L	-	0.035	100	0.035	0.25 - 3	10		0.35 J				0.37 J	0.32 J	0.25 J					1.1 J		
Cobalt	Dissolved	7440-48-4	ug/L	n	0.6	-	0.6	0.11 - 59.6	19	0.42 J	4.5 J	7.4			0.12 J	0.11 J	4.8 J		11.7		6.1	9.1 J		
Copper	Dissolved	7440-50-8	ug/L	n	80	1300	80	0.17 - 15	16		5.5 J	0.77 J					0.22 J-			0.31 J	0.17 J	7.4 J	0.75 J	1.5 J
Iron	Dissolved	7439-89-6	ug/L	n	1400	-	1400	129 - 52900	15	9480 J		25400	52900	19300				529	40900	44800	17700			
Lead	Dissolved	7439-92-1	ug/L	L	-	15	15	0.061 - 0.072	2	0.061 J						0.072 J								
Magnesium	Dissolved	7439-95-4	ug/L	-	-	-	-	10700 - 145000	30	27000	39600	103000	49500	42200	15800	16200	13200	64700	19100	10700	44500	50000	25500	36000
Manganese	Dissolved	7439-96-5	ug/L	n	43	-	43	4.6 - 77000	29	665	4080	5770	916	1450	4.6	5.1	1450	541	2970	330	2300	21500		87.2
Mercury	Dissolved	7439-97-6	ug/L	n	0.063	2	0.063	0.018 - 0.14	9	0.026 J-		0.044 J	0.036 J-	0.029 J-					0.041 J	0.028 J	0.049 J			
Nickel	Dissolved	7440-02-0	ug/L	n	39	-	39	1 - 34	24	1.9	3.1 J	6.2			1.2	1.1	3.3 J		3.3	1.1	2.3	16.3 J	1	2.6
Potassium	Dissolved	7440-09-7	ug/L	-	-	-	-	2350 - 63000	30	9680	17800	14800	21100	34300	2350	2480	5240	41700	4870	6390	30400	32700	5330	10900
Selenium	Dissolved	7782-49-2	ug/L	n	10	50	10	0.4 - 2.9	7			0.68 J											0.4 J	0.79 J
Silver	Dissolved	7440-22-4	ug/L	n	9.4	-	9.4	0 - 0	0															
Sodium	Dissolved	7440-23-5	ug/L	-	-	-	-	6610 - 492000	30	15100	145000	35200	112000	158000	11400	11800	21200	231000	95900	6610	37100	285000	74300	91300
Thallium	Dissolved	7440-28-0	ug/L	n	0.02	2	0.02	0 - 0	0															
Vanadium	Dissolved	7440-62-2	ug/L	n	8.6	-	8.6	0.24 - 2.7	14	0.24 J	1.1 J	0.52 J-		0.56 J	0.32 J	0.37 J			0.43 J-		0.56 J-	0.44 J		0.36 J-
Zinc	Dissolved	7440-66-6	ug/L	n	600	-	600	2.2 - 11.1	17	7.3 J	4.5					2.5 J	6.2		5.7		7			2.4

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-8b

Inorganics Detected in Shallow Groundwater -Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Type	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW31	MW32	MW33	MW35	MW38	MW39	MW40	MW41D	MW41D-DUP	MW42	MW43	MW44	MW46	MW47	MW47-DUP
										Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Aluminum	Total	7429-90-5	ug/L	n	2000	-	2000	2.8 - 1660	9	79.2 J		248				212			22.5					
Antimony	Total	7440-36-0	ug/L	n	0.78	6	0.78	0.13 - 0.13	1								0.13 J							
Arsenic	Total	7440-38-2	ug/L	c	0.052	10	0.052	0.12 - 51.3	18					1.5	0.28 J		1.2	1.1	0.34 J		0.92		0.3 J	0.35 J
Barium	Total	7440-39-3	ug/L	n	380	2000	380	33.1 - 1220	30	33.1 J	87.1	75.4	72.4	408	55.8	126	592	555	121	43.7 J	89.9	87.8 J	55.4	53.5
Beryllium	Total	7440-41-7	ug/L	n	2.5	4	2.5	0.084 - 0.084	1															
Boron	Total	7440-42-8	ug/L	n	400	-	400	28.9 - 2920	25	124	503		117 J+	1330 J+	111		220 J+	218 J+	277	351	101 J+	501	326	323
Cadmium	Total	7440-43-9	ug/L	n	0.92	5	0.92	0.033 - 2.2	11						0.076 J		2.2	2.1	0.073 J				0.058 J	0.035 J
Calcium	Total	7440-70-2	ug/L	-	-	-	-	17300 - 197000	29	48000	54900	54000	71800	117000	66200	17300	92000	88500	51800		61700	58800	55500	52900
Chromium	Total	7440-47-3	ug/L	-	0.035	100	0.035	0.24 - 4.7	16	2.4 J		1.2 J		1.4 J	2.5	3.8	1.6 J	1.5 J	0.24 J	1.5 J		3.6 J		
Cobalt	Total	7440-48-4	ug/L	n	0.6	-	0.6	1.2 - 66.1	11		2.1						65.6	66.1					1.3	1.2
Copper	Total	7440-50-8	ug/L	n	80	1300	80	0.14 - 9	21	2 J	2.6				0.44 J				3.2 J	1.5 J		4 J	1.3 J	0.99 J
Cyanide	Total	57-12-5	ug/L	n	0.15	200	0.15	1.1 - 1.3	2														1.3 J-	
Iron	Total	7439-89-6	ug/L	n	1400	-	1400	132 - 53400	17	189 J		274		3350		544	948	919		2260	3220	132 J		
Lead	Total	7439-92-1	ug/L	L	-	15	15	0.35 - 19.8	3										0.35 J					
Magnesium	Total	7439-95-4	ug/L	-	-	-	-	10800 - 105000	30	32800	38100	36600	42900	61500	42900	18300	65600	62200	21900	17400 J	38500	41100	38200	36200
Manganese	Total	7439-96-5	ug/L	n	43	-	43	2.5 - 71800	30	825	22.4	643	3730	5350	6	106	65900	71800	1680	793	11800	6160	22.3	21.7
Mercury	Total	7439-97-6	ug/L	n	0.063	2	0.063	0.015 - 0.12	7				0.015 J-	0.12 J			0.016 J-	0.016 J-						
Nickel	Total	7440-02-0	ug/L	n	39	-	39	1.1 - 32	30	4.1 J	4.8 J	2.3	3.4	7.4	3.2	6.1	32	30.5	3.7	2.6 J	1.8	3.9 J	2.9	2.9
Potassium	Total	7440-09-7	ug/L	-	-	-	-	2360 - 53800	27		13900	13800	9810	30600	7430	2700	13500	13100	6700		8020		10300	10000
Selenium	Total	7782-49-2	ug/L	n	10	50	10	0.41 - 3.5	7			2.4 J			3.5 J		0.48 J	0.41 J				3 J-		
Silver	Total	7440-22-4	ug/L	n	9.4	-	9.4	0 - 0	0															
Sodium	Total	7440-23-5	ug/L	-	-	-	-	6640 - 3E+06	30	2200000	145000	48800	73100	204000	119000	59900	352000	377000	90600	2300000	68200	2360000	107000	102000
Thallium	Total	7440-28-0	ug/L	n	0.02	2	0.02	3.9 - 3.9	1													3.9 J		
Vanadium	Total	7440-62-2	ug/L	n	8.6	-	8.6	0.26 - 5.9	16	1 J		1 J	0.49 J	0.92 J		0.52 J	0.26 J	0.33 J			0.54 J			
Zinc	Total	7440-66-6	ug/L	n	600	-	600	2 - 18.8	20			5.3	3.4	3.8	4.8	5.8	8.4	6.9	2 J		3			2.6
Aluminum	Dissolved	7429-90-5	ug/L	n	2000	-	2000	2.8 - 3.6	2															
Antimony	Dissolved	7440-36-0	ug/L	n	0.78	6	0.78	2 - 2	1															
Arsenic	Dissolved	7440-38-2	ug/L	c	0.052	10	0.052	0.15 - 49.2	26	0.63 J	0.27 J			3.6	0.28 J		1.4	1.2	0.35 J	2.3 J	0.89		0.31 J	0.34 J
Barium	Dissolved	7440-39-3	ug/L	n	380	2000	380	37.9 - 1130	26		78.7	72.1	51.4	880	54	118	593	534	124		82.3		49.2	47.5
Beryllium	Dissolved	7440-41-7	ug/L	n	2.5	4	2.5	0.052 - 0.052	1															
Cadmium	Dissolved	7440-43-9	ug/L	n	0.92	5	0.92	0.029 - 2.2	6								2.2	2	0.064 J					
Calcium	Dissolved	7440-70-2	ug/L	-	-	-	-	17400 - 278000	30	62100	57300	53800	54600	278000	66200	17400	97300	88500	51600	60000	59000	85100	50300	48800
Chromium	Dissolved	7440-47-3	ug/L	-	0.035	100	0.035	0.25 - 3	10					3	2 J	2.6							0.29 J	0.28 J
Cobalt	Dissolved	7440-48-4	ug/L	n	0.6	-	0.6	0.11 - 59.6	19		2.1	1.2 J	1.8 J	27.6 J			59.6 J	54.4 J	3.5		3.2 J		1.2 J	1.1 J
Copper	Dissolved	7440-50-8	ug/L	n	80	1300	80	0.17 - 15	16		2.8			12.7	0.35 J-		15	13.8	2 J				1 J	0.88 J
Iron	Dissolved	7439-89-6	ug/L	n	1400	-	1400	129 - 52900	15				323 J	5670 J			783 J	656 J		4470	2580 J	129		
Lead	Dissolved	7439-92-1	ug/L	L	-	15	15	0.061 - 0.072	2															
Magnesium	Dissolved	7439-95-4	ug/L	-	-	-	-	10700 - 145000	30	32600	39500	36100	32300	145000	43900	17700	68800	61600	21600	32600	36500	39200	35100	33800
Manganese	Dissolved	7439-96-5	ug/L	n	43	-	43	4.6 - 77000	29	872	21.8	619	2890	13000	5.5	129	69300	77000	1620	1550	13200	6190	20	19.6
Mercury	Dissolved	7439-97-6	ug/L	n	0.063	2	0.063	0.018 - 0.14	9					0.14 J						0.018 J-				
Nickel	Dissolved	7440-02-0	ug/L	n	39	-	39	1 - 34	24		4.8	2.2 J	2.8 J	15.6 J	2.8 J	7.5 J	34 J	30.6 J	3.6		1.7 J		2.6 J	2.4 J
Potassium	Dissolved	7440-09-7	ug/L	-	-	-	-	2350 - 63000	30	9440	14000	13700 J	7430 J	63000 J	7730	2620 J	13600 J	12800 J	6600	11000	7620 J	17100	10000	9680
Selenium	Dissolved	7782-49-2	ug/L	n	10	50	10	0.4 - 2.9	7			2.6 J		0.7 J	2.9 J		0.49 J							
Silver	Dissolved	7440-22-4	ug/L	n	9.4	-	9.4	0 - 0	0															
Sodium	Dissolved	7440-23-5	ug/L	-	-	-	-	6610 - 492000	30	45600	138000	47900	54500	492000	125000	56200	368000	410000	85300	106000	64700	141000	103000	100000
Thallium	Dissolved	7440-28-0	ug/L	n	0.02	2	0.02	0 - 0	0															
Vanadium	Dissolved	7440-62-2	ug/L	n	8.6	-	8.6	0.24 - 2.7	14					2.7					0.33 J				0.46 J	0.44 J
Zinc	Dissolved	7440-66-6	ug/L	n	600	-	600	2.2 - 11.1	17		2.7	4.8 J	6.5 J	11.1 J	5.9	7.7 J	9 J	7.9 J	2.2 J		3.3 J			

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because resul

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the assc

Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-8c

Inorganics Detected in Shallow Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Fraction	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW08		MW13S		MW14S		MW15S		MW16S		MW17S		MW18S		MW24		MW25		MW26D		MW26S		MW27		MW28		MW29		MW30		MW31		MW32	
												Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Aluminum	Total	7429-90-5	n	2000	-	2000	UG/L	3.4	-	29300	21					46.2		NA		14.5	J	3.4	J	15.5	J	85.3		5210		29300	J			94.8	J			7.3	J	20.6		104	J	4.7	J
Antimony	Total	7440-36-0	n	0.78	6	0.78	UG/L	0.11	-	10	5							NA										10								0.14	J								
Arsenic	Total	7440-38-2	c	0.052	10	0.052	UG/L	0.1	-	84.1	28	0.85		0.22	J	13.3		NA		2.3		0.12		0.11		1.4		15		11.6	J	0.49	J	14.4	J	0.37		0.18		0.22		0.38		0.24	
Barium	Total	7440-39-3	n	380	2000	380	UG/L	30.9	-	1220	28	159	J	165	J	166	J	NA		445		50.8		30.9		852		964		380	J	1220	J	527	J	161		78.9		80.9		58.9		99.5	
Beryllium	Total	7440-41-7	n	2.5	4	2.5	UG/L	0.031	-	1.5	6							NA						0.043	J			0.16	J			1.5	J-									0.067	J		
Cadmium	Total	7440-43-9	n	0.92	5	0.92	UG/L	0.018	-	8.3	25	0.26	J	0.06	J			NA		0.018	J	0.036	J	0.25	J	0.045	J	8.3		0.29	J					1.1		0.26	J	0.19	J	0.24	J	0.045	J
Calcium	Total	7440-70-2	-	-	-	-	UG/L	5720	-	605000	28	150000	J	52600	J	173000	J	NA		71900		27700		22500		53200		33500		43500	J	76200	J	71200	J	65300		5720	J	6860	J	6940	J	58900	
Chromium	Total	7440-47-3	c	0.035	100	0.035	UG/L	0.15	-	31.3	20							NA		1.7	J	0.41	J	0.15	J	1.3	J	25.5		31.3	J					0.97	J	0.37	J	0.17	J	2.3		0.24	J
Cobalt	Total	7440-48-4	n	0.6	-	0.6	UG/L	0.066	-	57.8	27	0.25	J	2.9	J	7.4		NA		13.4		0.066	J	4.8		1.6		6.5		22.7	J			7.3	J	10.3		1.7		1.3		4.2		1.5	
Copper	Total	7440-50-8	n	80	1300	80	UG/L	0.27	-	94.6	18			5.1				NA		0.65	J			0.37	J	1.4	J-	94.6		36.5						10.9		0.27	J-	0.6	J-	2	J-	1.9	J-
Cyanide	Total	57-12-5	n	0.15	200	0.15	UG/L	16.8	-	16.8	1			NA				NA				NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Iron	Total	7439-89-6	n	1400	-	1400	UG/L	9.6	-	137000	17	8350	J			24400	J	NA		20600	J	9.6	J	22.2	J	137000		40000		123000	J	50300	J	18300	J							845			
Lead	Total	7439-92-1	L	-	15	15	UG/L	0.039	-	2400	22			0.07	J			NA		0.046	J	0.069	J	0.06	J	7.6		2400		36		2.2		0.16	J	0.089	J	0.056	J	0.057	J	0.92	J	0.042	J
Magnesium	Total	7439-95-4	-	-	-	-	UG/L	3250	-	438000	28	27100	J	22500	J	102000	J	NA		42300		13600		9870		21200		81600		33200	J	9560	J	39900	J	50000		3250	J	4270	J	4410	J	42600	
Manganese	Total	7439-96-5	n	43	-	43	UG/L	4.1	-	18600	28	564		2220	J	5180		NA		1210		10.9		1280		7640		334		4450	J	313	J	2120	J	18600		137		143		107		24.2	
Mercury	Total	7439-97-6	n	0.063	2	0.063	UG/L	0.014	-	0.28	17	0.049	J			0.048	J	NA		0.018	J+			0.016	J	0.072	J	0.28	J							0.055	J	0.054	J	0.057	J	0.048	J	0.075	J
Nickel	Total	7440-02-0	n	39	-	39	UG/L	0.61	-	28.7	27	0.92	J	1.5	J	4.3	J	NA		7.8		0.61	J	2.3		1.3		21		18	J			2	J	19		2.8		2		3.9		3.7	
Potassium	Total	7440-09-7	-	-	-	-	UG/L	2520	-	130000	28	9510	J	13300		13000	J	NA		32900		2520		4390		14900		47900		4430		6240		30000		31600		5520		7710		8190		14400	
Selenium	Total	7782-49-2	n	10	50	10	UG/L	0.27	-	0.72	7							NA		0.45	J	0.48	J	0.27	J													0.72	J			0.31	J		
Silver	Total	7440-22-4	n	9.4	-	9.4	UG/L	0.022	-	25.3	3							NA										25.3		0.032	J														
Sodium	Total	7440-23-5	-	-	-	-	UG/L	6340	-	1230000	27	15500	J	117000		33700	J	NA		156000		12400		17900		139000		214000		172000	J-	6340	J-	37600		254000		12500	J			12500	J	129000	
Thallium	Total	7440-28-0	n	0.02	2	0.02	UG/L	0	-	0	0							NA																											
Vanadium	Total	7440-62-2	n	8.6	-	8.6	UG/L	0.15	-	52	14	0.15	J			0.62	J	NA		0.77	J	0.47	J	0.17	J			11.3		52												4.4			
Zinc	Total	7440-66-6	n	600	-	600	UG/L	1.6	-	1170	25	9.5		3.7	J+			NA		3.1		2.1		32.8		15		1170		70.8	J+	7.8	J+	6.2	J+	2.1		4.2		2.9		12		1.9	J
Aluminum	Dissolved	7429-90-5	n	2000	-	2000	UG/L	1.6	-	20	29	20		1.9	J	2.5		1.6		14.4	J	6	J	12.1	J	4.3	J	3.1	J	2.9	J	8.2	J	2.1	J	2.7	J	3.9	J	3.7	J	2.8	J	3	J
Antimony	Dissolved	7440-36-0	n	0.78	6	0.78	UG/L	0.11	-	2	11	0.11				2		2								1.2	J	0.14	J							0.14	J								
Arsenic	Dissolved	7440-38-2	c	0.052	10	0.052	UG/L	0.089	-	57.3	29	0.92		0.22		13.5		38		2.3		0.12		0.11		1.1		3.8		11.5		0.44		12.7		0.37		0.17		0.18		0.22		0.23	
Barium	Dissolved	7440-39-3	n	380	2000	380	UG/L	31.4	-	1240	29	171		163		171		109		451		53.1		31.4		756		594		252		1240		563		158		74.6		78.2		56.3		97.9	
Beryllium	Dissolved	7440-41-7	n	2.5	4	2.5	UG/L	0.028	-	1	9	1				1		1						0.028	J-					0.028	J														
Cadmium	Dissolved	7440-43-9	n	0.92	5	0.92	UG/L	0.014	-	2.2	24	0.031		0.062	J	1		1		0.019	J	0.021	J	0.23	J	0.014	J									0.93	J	0.24	J	0.2	J	0.23	J	0.043	J
Calcium	Dissolved	7440-70-2	-	-	-	-	UG/L	18200	-	175000	29	155000		53700		175000		74600		69100		26900		22600		54600		26500		24500		77300		74100		67200		43600		55700		57000		59800	
Chromium	Dissolved	7440-47-3	c	0.035	100	0.035	UG/L	0.057	-	3	29	0.14		0.13	J	0.37		0.53		1.7	J	0.39	J	0.092	J	0.84	J	0.11	J	0.73	J	0.91	J	0.42	J	0.94	J	0.31	J	0.082	J	0.079	J	0.23	J
Cobalt	Dissolved	7440-48-4	n	0.6	-	0.6	UG/L	0.063	-	59.3	29	0.27		2.7		7.4		7.4		13.5		0.063	J	4.7		1.5		0.2	J	14.2		0.33	J	6.9		10.3		1.6		1.2		3.7		1.5	
Copper	Dissolved	7440-50-8	n	80	1300	80	UG/L	0.27	-	13.7	15	0.59		4.6		0.56		0.27																		9.5								2.5	
Iron	Dissolved	7439-89-6	n	1400	-	1400	UG/L	2.8	-	129000	27	8050		26.6	J	24300		39600		20700						129000		3960		47900		49600		18000		99.1	J	9.9	J	5.6	J	16.3	J	11.8	J
Lead	Dissolved	7439-92-1	L	-	15	15	UG/L	0.022	-	0.14	29	0.085		0.037	J	0.057		0.14		0.053	J	0.022	J	0.042	J	0.11	J	0.073	J	0.038	J	0.047	J	0.042	J	0.04	J	0.04	J	0.049	J	0.055	J	0.1	J
Magnesium	Dissolved	7439-95-4	-	-	-	-	UG/L	9790	-	80800	29	27300		20600		23400		53700		41500		13300		9790	J	21900		80800		17600		9950		41400		52200		25000		34800		35700		42900	
Manganese	Dissolved	7439-96-5	n	43	-	43	UG/L	1.3	-	72000	29	567		2100		5140		646		1170		12		1310		7890		118		2100		310		2350		16700		1010		1110		858		24.7	
Mercury	Dissolved	7439-97-6	n	0.063	2	0.063	UG/L	0.016	-	0.052	15	0.032				0.041		0.028				0.032	J+	0.021	J+	0.021	J	0.021	J	0.035	J														
Nickel	Dissolved	7440-02-0	n	39	-	39	UG/L	0.52	-	29.5	29	1		1.5		4.6		2.1		8		0.63	J	2.3		0.93	J	2.6		3.9		0.52	J	1.8		18.7		2.8		1.9		2.8		3.7	
Potassium	Dissolved	7440-09-7	-	-	-	-	UG/L	2540	-	47100	27	9890		11600		12800		18000		33100		2540		4420		14500		47100		4190	J	6660		NA		31400		5280		7570		8140		15100	
Selenium	Dissolved	7782-49-2	n	10	50	10	UG/L	0.2	-	5	13	5				5		5								0.2	J											0.49	J	0.43	J			0.2	J
Silver	Dissolved	7440-22-4	n	9.4	-	9.4	UG/L	1	-	1	7	1				1		1																											
Sodium	Dissolved	7440-23-5	-	-	-	-	UG/L	6790	-	362000	29	15600		120000	J	33200		73800		154000		12500		18000		136000		217000		99900	J	6790	J	40300	J	251000		84000		91000		44900		133000	
Thallium	Dissolved	7440-28-0	n	0.02	2	0.02	UG/L	1	-	1	7	1				1		1																											
Vanadium	Dissolved	7440-62-2	n	8.6	-	8.6	UG/L	0.15	-	2.6	20	2.6				2.6		2.6		0.74	J	0.42	J	0.15	J	0.21	J-	0.84	J-															0.6	J
Zinc	Dissolved	7440-66-6	n	600	-	600	UG/L	1.4	-	29.7	29	7.7		3	J	11.2		1.8		3.9	J	2.2	J	29.7	J	8.9	J	1.4	J	7.2	J	6	J	6.8	J	7	J	2.3	J	2.4	J	8.5	J	4.8	J

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-8c

Inorganics Detected in Shallow Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Fraction	CAS	KEY	RSL*	MCL**	Screening Value	Units	MW33 Result		MW35 Result		MW38 Result		MW39 Result		MW40 Result		MW41D Result		MW41S Result		MW42 Result		MW43 Result		MW44 Result		MW46 Result		MW47 Result	
Aluminum	Total	7429-90-5	n	2000	-	2000	UG/L	373	J			415		53.7		57.9		25.7		422		61.4				6.9	J			9.6	J
Antimony	Total	7440-36-0	n	0.78	6	0.78	UG/L					0.17	J					0.13	J	0.11	J										
Arsenic	Total	7440-38-2	c	0.052	10	0.052	UG/L	0.24	J	0.19		1.3		0.19		0.1		0.81		84.1		0.21		0.97		2.5		0.16		0.27	
Barium	Total	7440-39-3	n	380	2000	380	UG/L	68.9	J	51.3	J	425		37.1		116	J	506		173		190		131	J	119		73.2	J	72.6	
Beryllium	Total	7440-41-7	n	2.5	4	2.5	UG/L					0.031	J							0.034	J										
Cadmium	Total	7440-43-9	n	0.92	5	0.92	UG/L	0.083	J	0.19	J	0.12	J	0.057	J	0.063	J	2.2		0.06	J	0.14	J	0.24	J	0.15	J	0.27	J	0.048	J
Calcium	Total	7440-70-2	-	-	-	-	UG/L	44700	J	59200	J	120000		49300		18400	J	90600		61200		79200		63100	J	76400		62100	J	605000	
Chromium	Total	7440-47-3	c	0.035	100	0.035	UG/L	5.2	J			2.4		2.8		3.2		0.99	J	6.1		0.28	J			0.24	J			0.27	J
Cobalt	Total	7440-48-4	n	0.6	-	0.6	UG/L	1.3	J	1.5		14		0.58	J	0.4	J	57.8		2.3		5		4.7		2.9		2.8		1.5	
Copper	Total	7440-50-8	n	80	1300	80	UG/L					5.9		0.51	J-			14.2				1.5	J-			1	J-	2.7		1.8	J-
Cyanide	Total	57-12-5	n	0.15	200	0.15	UG/L	NA		NA		NA		NA		NA				16.8	J	NA		NA		NA		NA		NA	
Iron	Total	7439-89-6	n	1400	-	1400	UG/L	443	J			4150						513	J	62700	J			2190	J	8040					
Lead	Total	7439-92-1	L	-	15	15	UG/L	0.34	J			0.47	J	0.24	J			0.12	J	2		0.11	J			0.039	J			0.05	J
Magnesium	Total	7439-95-4	-	-	-	-	UG/L	30000	J	33700	J	64500		32200		17900	J	64400		22100		39500		36600	J	46400		31100	J	438000	
Manganese	Total	7439-96-5	n	43	-	43	UG/L	616	J	2820		4990		4.1		48.6		3520		3750		2560		2040		10000		3660		16.1	
Mercury	Total	7439-97-6	n	0.063	2	0.063	UG/L					0.11	J	0.057	J			0.014	J			0.058	J			0.04	J			0.042	J
Nickel	Total	7440-02-0	n	39	-	39	UG/L	13.6	J	2.1	J	5.8		1.8		5.1	J	28.7		19.1		3		3.4	J	1.2		2.1	J	3.5	
Potassium	Total	7440-09-7	-	-	-	-	UG/L	14800		7550	J	34800		5730		2680	J	12300		5370	J	7860		10200	J	8930		12600	J	130000	
Selenium	Total	7782-49-2	n	10	50	10	UG/L											0.58	J	0.29	J										
Silver	Total	7440-22-4	n	9.4	-	9.4	UG/L									0.022	J														
Sodium	Total	7440-23-5	-	-	-	-	UG/L	63000		52400	J	170000		82900		62500	J	16700	J	153000		101000		106000	J	76000		96100	J	1230000	
Thallium	Total	7440-28-0	n	0.02	2	0.02	UG/L																								
Vanadium	Total	7440-62-2	n	8.6	-	8.6	UG/L			0.27	J					0.45	J	0.21	J	1.5	J			0.21	J			0.38	J		
Zinc	Total	7440-66-6	n	600	-	600	UG/L	12	J+			4.9		4.7		4.4		10.7		25.3		1.7	J	6.1		2.3				1.6	J
Aluminum	Dissolved	7429-90-5	n	2000	-	2000	UG/L	2.8	J	2.4		2.8	J	2.4	J	3		5.9	J	6.4	J	2.8	J	1.6		2	J	1.8		5.3	J
Antimony	Dissolved	7440-36-0	n	0.78	6	0.78	UG/L			2		0.13	J			2								2				2			
Arsenic	Dissolved	7440-38-2	c	0.052	10	0.052	UG/L	0.13		0.18		1.2		0.16		0.089		0.79		57.3		0.18		0.93		2.3		0.16		0.25	
Barium	Dissolved	7440-39-3	n	380	2000	380	UG/L	66.2		54.5		420		36.3		120		507		150		188		135		113		76.5		70.3	
Beryllium	Dissolved	7440-41-7	n	2.5	4	2.5	UG/L			1						1								1				1			
Cadmium	Dissolved	7440-43-9	n	0.92	5	0.92	UG/L	0.085	J	0.19		0.12	J	0.055	J	0.059		2.2				0.14	J	0.24		0.15	J	0.27		0.049	J
Calcium	Dissolved	7440-70-2	-	-	-	-	UG/L	44900		57900		121000		49500		18200		91200		59400		78300		60400		74900		61800		61000	
Chromium	Dissolved	7440-47-3	c	0.035	100	0.035	UG/L	0.63	J	0.057		1.2	J	2.5		3		1	J	1	J	0.16	J	0.2		0.19	J	0.11		0.19	J
Cobalt	Dissolved	7440-48-4	n	0.6	-	0.6	UG/L	0.77	J	1.5		13.5		0.52	J	0.37		59.3		1.6		4.8		4.7		2.8		2.8		1.5	
Copper	Dissolved	7440-50-8	n	80	1300	80	UG/L			0.87		5.1		0.48	J-	0.43		13.7				2.7		0.7				2.8		2	
Iron	Dissolved	7439-89-6	n	1400	-	1400	UG/L	14.9	J	16.2		3660		2.8	J	3.5		579		48200		7.1	J	2120		7530		12.5		7.7	J
Lead	Dissolved	7439-92-1	L	-	15	15	UG/L	0.025	J	0.054		0.075	J	0.028	J	0.038		0.1	J	0.035	J	0.14	J	0.045		0.034	J	0.048		0.063	J
Magnesium	Dissolved	7439-95-4	-	-	-	-	UG/L	27400		32700		63400		33100		17500		63700		21900		39500		35400		45400		30200		43000	
Manganese	Dissolved	7439-96-5	n	43	-	43	UG/L	558		2700		5160		1.3		48.7		72000		3730		2710		1960		10100		3820		17.9	J
Mercury	Dissolved	7439-97-6	n	0.063	2	0.063	UG/L			0.036		0.052	J	0.016	J	0.035				0.016	J+			0.038				0.028			
Nickel	Dissolved	7440-02-0	n	39	-	39	UG/L	10.6		2.2		5.3		1.7		5		29.5		17.9		3		3.5		0.99	J	2.2		3.5	
Potassium	Dissolved	7440-09-7	-	-	-	-	UG/L	12500		7560		33600		5700		2600		12500				7660		9730		8270	J	12000		13300	
Selenium	Dissolved	7782-49-2	n	10	50	10	UG/L			5		0.32	J			5						0.53	J	0.36				5			
Silver	Dissolved	7440-22-4	n	9.4	-	9.4	UG/L			1						1								1				1			
Sodium	Dissolved	7440-23-5	-	-	-	-	UG/L	64500	J	51600		170000		81300		60000		362000		162000		102000		103000		74400		93300		124000	
Thallium	Dissolved	7440-28-0	n	0.02	2	0.02	UG/L			1						1								1				1			
Vanadium	Dissolved	7440-62-2	n	8.6	-	8.6	UG/L			0.25		0.75	J	1.4	J	0.38		0.16	J	0.27	J	0.33	J	0.15		0.34	J	0.35		0.78	J
Zinc	Dissolved	7440-66-6	n	600	-	600	UG/L	7.3	J	1.7		4	J	5.2	J	4.2		14.9	J	15.5	J	3	J	6.1		2.4	J	1.9		5.4	J

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-9a

Volatile Organic Compounds (VOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW08		MW13S		MW14S		MW15S		MW16S		MW17S		MW17S-DUP		MW18S		MW24		MW25		MW26D		MW26S		MW27		MW28	
											03/24/14		03/24/14		03/24/14		03/05/14		03/06/14		03/06/14		03/06/14		03/10/14		03/21/14		03/21/14		03/07/14		03/07/14		03/11/14		03/12/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1,1-Trichloroethane	71-55-6	UG/L	n	800	200	200	0	-	0	0																												
1,1,2,2-Tetrachloroethane	79-34-5	UG/L	c	0.076	-	0.076	0	-	0	0																												
1,1,2-Trichloro-1,2,2-trifluoroethan	76-13-1	UG/L	n	5500	-	5500	0	-	0	0																												
1,1,2-Trichloroethane	79-00-5	UG/L	c	0.28	5	0.28	0	-	0	0																												
1,1-Dichloroethane	75-34-3	UG/L	c	2.8	-	2.8	0	-	0	0																												
1,1-Dichloroethene	75-35-4	UG/L	n	28	7	7	0	-	0	0																												
1,2,3-Trichlorobenzene	87-61-6	UG/L	n	0.7	-	0.7	0.56	-	0.56	1																			0.56									
1,2,4-Trichlorobenzene	120-82-1	UG/L	n	0.4	70	0.4	0	-	0	0																												
1,2-Dibromo-3-chloropropane	96-12-8	UG/L	c	0.00033	0.2	0.00033	0	-	0	0																												
1,2-Dibromoethane	106-93-4	UG/L	c	0.0075	0.05	0.0075	0	-	0	0																												
1,2-Dichlorobenzene	95-50-1	UG/L	n	30	600	30	1.2	-	1.2	1																			1.2									
1,2-Dichloroethane	107-06-2	UG/L	c	0.17	5	0.17	0	-	0	0																												
1,2-Dichloropropane	78-87-5	UG/L	c	0.44	5	0.44	0	-	0	0																												
1,3-Dichlorobenzene	541-73-1	UG/L	-	-	-	-	0	-	0	0																												
1,4-Dichlorobenzene	106-46-7	UG/L	c	0.48	75	0.48	0	-	0	0																												
2-Butanone	78-93-3	UG/L	n	560	-	560	12	-	12	1																			12									
2-Hexanone	591-78-6	UG/L	n	3.8	-	3.8	0	-	0	0																												
4-Methyl-2-pentanone	108-10-1	UG/L	n	630	-	630	0	-	0	0																												
Acetone	67-64-1	UG/L	n	1400	-	1400	14	-	69	3																	37		69									
Benzene	71-43-2	UG/L	c	0.46	5	0.46	3.1	-	3.1	1																			3.1									
Bromochloromethane	74-97-5	UG/L	n	8.3	-	8.3	0	-	0	0																												
Bromodichloromethane	75-27-4	UG/L	c	0.13	80	0.13	0	-	0	0																												
Bromoform	75-25-2	UG/L	c	3.3	80	3.3	0	-	0	0																												
Bromomethane	74-83-9	UG/L	n	0.75	-	0.75	0	-	0	0																												
Carbon disulfide	75-15-0	UG/L	n	81	-	81	1.4	-	1.7	2																			1.7									
Carbon tetrachloride	56-23-5	UG/L	c	0.46	5	0.46	0	-	0	0																												
Chlorobenzene	108-90-7	UG/L	n	7.8	100	7.8	1	-	7.2	3					1.2																							
Chloroethane	75-00-3	UG/L	n	2100	-	2100	0	-	0	0																												
Chloroform	67-66-3	UG/L	c	0.22	80	0.22	0	-	0	0																												
Chloromethane	74-87-3	UG/L	n	19	-	19	0	-	0	0																												
cis-1,2-Dichloroethene	156-59-2	UG/L	n	3.6	70	3.6	0.28	-	46	8	1.8		0.3	J	0.28	J											0.38	J	0.45	J								
cis-1,3-Dichloropropene	10061-01-5	UG/L	c	0.47	-	0.47	0	-	0	0																												
Cyclohexane	110-82-7	UG/L	n	1300	-	1300	0.31	-	0.31	1																			0.31	J								
Dibromochloromethane	124-48-1	UG/L	c	0.87	80	0.87	0	-	0	0																												
Dichlorodifluoromethane	75-71-8	UG/L	n	20	-	20	0	-	0	0																												
Ethylbenzene	100-41-4	UG/L	c	1.5	700	1.5	1.4	-	1.4	1																			1.4									
Isopropylbenzene	98-82-8	UG/L	n	45	-	45	0.32	-	0.32	1																			0.32	J								
m,p-Xylene	179601-23-1	UG/L	n	19	-	19	5.8	-	5.8	1																			5.8									
Methyl acetate	79-20-9	UG/L	n	2000	-	2000	0	-	0	0																												
Methyl tert-butyl ether	1634-04-4	UG/L	c	14	-	14	0.29	-	1.7	5																			0.55									
Methylcyclohexane	108-87-2	UG/L	-	-	-	-	0.38	-	0.38	1																			0.38	J								
Methylene chloride	75-09-2	UG/L	c	11	5	5	0	-	0	0																												
o-Xylene	95-47-6	UG/L	n	19		19	0.24	-	4.9	2																	0.24	J	4.9									
Styrene	100-42-5	UG/L	n	120	100	100	0	-	0	0																												
Tetrachloroethene	127-18-4	UG/L	n	4.1	5	4.1	0.16	-	0.23	2	0.23	J																	0.16	J								
Toluene	108-88-3	UG/L	n	110	1000	110	0.17	-	4.1	6							1.3	J	1.5	J	1.7	J					0.17	J	4.1									
trans-1,2-Dichloroethene	156-60-5	UG/L	n	36	100	36	0.25	-	0.25	1																												
trans-1,3-Dichloropropene	10061-02-6	UG/L	c	0.47	-	0.47	0	-	0	0																												
Trichloroethene	79-01-6	UG/L	n	0.28	5	0.28	0.26	-	7.2	5	0.26	J																	0.4	J								
Trichlorofluoromethane	75-69-4	UG/L	n	520	-	520	0	-	0	0																												
Vinyl chloride	75-01-4	UG/L	c	0.019	2	0.019	3.7	-	4.2	2																			4.2									

Table 4-9a

Volatile Organic Compounds (VOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW29		MW30		MW31		MW32		MW33		MW35		MW38		MW39		MW40		MW41D		MW41D-DUP		MW41S		MW42		MW43	
									03/14/14		03/14/14		03/13/14		03/14/14		03/20/14		03/12/14		03/19/14		03/24/14		03/12/14		03/18/14		03/18/14		03/18/14		03/20/14		03/12/14	
									Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1,1-Trichloroethane	71-55-6	UG/L	n	800	200	200	0 - 0	0																												
1,1,2,2-Tetrachloroethane	79-34-5	UG/L	c	0.076	-	0.076	0 - 0	0																												
1,1,2-Trichloro-1,2,2-trifluoroetha	76-13-1	UG/L	n	5500	-	5500	0 - 0	0																												
1,1,2-Trichloroethane	79-00-5	UG/L	c	0.28	5	0.28	0 - 0	0																												
1,1-Dichloroethane	75-34-3	UG/L	c	2.8	-	2.8	0 - 0	0																												
1,1-Dichloroethene	75-35-4	UG/L	n	28	7	7	0 - 0	0																												
1,2,3-Trichlorobenzene	87-61-6	UG/L	n	0.7	-	0.7	0.56 - 0.56	1																												
1,2,4-Trichlorobenzene	120-82-1	UG/L	n	0.4	70	0.4	0 - 0	0																												
1,2-Dibromo-3-chloropropane	96-12-8	UG/L	c	0.00033	0.2	0.00033	0 - 0	0																												
1,2-Dibromoethane	106-93-4	UG/L	c	0.0075	0.05	0.0075	0 - 0	0																												
1,2-Dichlorobenzene	95-50-1	UG/L	n	30	600	30	1.2 - 1.2	1																												
1,2-Dichloroethane	107-06-2	UG/L	c	0.17	5	0.17	0 - 0	0																												
1,2-Dichloropropane	78-87-5	UG/L	c	0.44	5	0.44	0 - 0	0																												
1,3-Dichlorobenzene	541-73-1	UG/L	-	-	-	-	0 - 0	0																												
1,4-Dichlorobenzene	106-46-7	UG/L	c	0.48	75	0.48	0 - 0	0																												
2-Butanone	78-93-3	UG/L	n	560	-	560	12 - 12	1																												
2-Hexanone	591-78-6	UG/L	n	3.8	-	3.8	0 - 0	0																												
4-Methyl-2-pentanone	108-10-1	UG/L	n	630	-	630	0 - 0	0																												
Acetone	67-64-1	UG/L	n	1400	-	1400	14 - 69	3					14																							
Benzene	71-43-2	UG/L	c	0.46	5	0.46	3.1 - 3.1	1																												
Bromochloromethane	74-97-5	UG/L	n	8.3	-	8.3	0 - 0	0																												
Bromodichloromethane	75-27-4	UG/L	c	0.13	80	0.13	0 - 0	0																												
Bromoform	75-25-2	UG/L	c	3.3	80	3.3	0 - 0	0																												
Bromomethane	74-83-9	UG/L	n	0.75	-	0.75	0 - 0	0																												
Carbon disulfide	75-15-0	UG/L	n	81	-	81	1.4 - 1.7	2																							1.4					
Carbon tetrachloride	56-23-5	UG/L	c	0.46	5	0.46	0 - 0	0																												
Chlorobenzene	108-90-7	UG/L	n	7.8	100	7.8	1 - 7.2	3													7.2															
Chloroethane	75-00-3	UG/L	n	2100	-	2100	0 - 0	0																												
Chloroform	67-66-3	UG/L	c	0.22	80	0.22	0 - 0	0																												
Chloromethane	74-87-3	UG/L	n	19	-	19	0 - 0	0																												
cis-1,2-Dichloroethene	156-59-2	UG/L	n	3.6	70	3.6	0.28 - 46	8													46		1.5													
cis-1,3-Dichloropropene	10061-01-5	UG/L	c	0.47	-	0.47	0 - 0	0																												
Cyclohexane	110-82-7	UG/L	n	1300	-	1300	0.31 - 0.31	1																												
Dibromochloromethane	124-48-1	UG/L	c	0.87	80	0.87	0 - 0	0																												
Dichlorodifluoromethane	75-71-8	UG/L	n	20	-	20	0 - 0	0																												
Ethylbenzene	100-41-4	UG/L	c	1.5	700	1.5	1.4 - 1.4	1																												
Isopropylbenzene	98-82-8	UG/L	n	45	-	45	0.32 - 0.32	1																												
m,p-Xylene	179601-23-	UG/L	n	19	-	19	5.8 - 5.8	1																												
Methyl acetate	79-20-9	UG/L	n	2000	-	2000	0 - 0	0																												
Methyl tert-butyl ether	1634-04-4	UG/L	c	14	-	14	0.29 - 1.7	5													1.7															
Methylcyclohexane	108-87-2	UG/L	-	-	-	-	0.38 - 0.38	1																												
Methylene chloride	75-09-2	UG/L	c	11	5	5	0 - 0	0																												
o-Xylene	95-47-6	UG/L	n	19		19	0.24 - 4.9	2																												
Styrene	100-42-5	UG/L	n	120	100	100	0 - 0	0																												
Tetrachloroethene	127-18-4	UG/L	n	4.1	5	4.1	0.16 - 0.23	2																												
Toluene	108-88-3	UG/L	n	110	1000	110	0.17 - 4.1	6					0.21	J																						
trans-1,2-Dichloroethene	156-60-5	UG/L	n	36	100	36	0.25 - 0.25	1													0.25	J														
trans-1,3-Dichloropropene	10061-02-6	UG/L	c	0.47	-	0.47	0 - 0	0																												
Trichloroethene	79-01-6	UG/L	n	0.28	5	0.28	0.26 - 7.2	5													7.2		0.58													
Trichlorofluoromethane	75-69-4	UG/L	n	520	-	520	0 - 0	0																												
Vinyl chloride	75-01-4	UG/L	c	0.019	2	0.019	3.7 - 4.2	2													3.7															

Table 4-9a

Volatile Organic Compounds (VOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW44		MW45		MW46		MW47		MW47-DUP	
											03/20/14		03/21/14		03/12/14		03/21/14		03/21/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1,1-Trichloroethane	71-55-6	UG/L	n	800	200	200	0	-	0	0										
1,1,2,2-Tetrachloroethane	79-34-5	UG/L	c	0.076	-	0.076	0	-	0	0										
1,1,2-Trichloro-1,2,2-trifluoroethar	76-13-1	UG/L	n	5500	-	5500	0	-	0	0										
1,1,2-Trichloroethane	79-00-5	UG/L	c	0.28	5	0.28	0	-	0	0										
1,1-Dichloroethane	75-34-3	UG/L	c	2.8	-	2.8	0	-	0	0										
1,1-Dichloroethene	75-35-4	UG/L	n	28	7	7	0	-	0	0										
1,2,3-Trichlorobenzene	87-61-6	UG/L	n	0.7	-	0.7	0.56	-	0.56	1										
1,2,4-Trichlorobenzene	120-82-1	UG/L	n	0.4	70	0.4	0	-	0	0										
1,2-Dibromo-3-chloropropane	96-12-8	UG/L	c	0.00033	0.2	0.00033	0	-	0	0										
1,2-Dibromoethane	106-93-4	UG/L	c	0.0075	0.05	0.0075	0	-	0	0										
1,2-Dichlorobenzene	95-50-1	UG/L	n	30	600	30	1.2	-	1.2	1										
1,2-Dichloroethane	107-06-2	UG/L	c	0.17	5	0.17	0	-	0	0										
1,2-Dichloropropane	78-87-5	UG/L	c	0.44	5	0.44	0	-	0	0										
1,3-Dichlorobenzene	541-73-1	UG/L	-	-	-	-	0	-	0	0										
1,4-Dichlorobenzene	106-46-7	UG/L	c	0.48	75	0.48	0	-	0	0										
2-Butanone	78-93-3	UG/L	n	560	-	560	12	-	12	1										
2-Hexanone	591-78-6	UG/L	n	3.8	-	3.8	0	-	0	0										
4-Methyl-2-pentanone	108-10-1	UG/L	n	630	-	630	0	-	0	0										
Acetone	67-64-1	UG/L	n	1400	-	1400	14	-	69	3										
Benzene	71-43-2	UG/L	c	0.46	5	0.46	3.1	-	3.1	1										
Bromochloromethane	74-97-5	UG/L	n	8.3	-	8.3	0	-	0	0										
Bromodichloromethane	75-27-4	UG/L	c	0.13	80	0.13	0	-	0	0										
Bromoform	75-25-2	UG/L	c	3.3	80	3.3	0	-	0	0										
Bromomethane	74-83-9	UG/L	n	0.75	-	0.75	0	-	0	0										
Carbon disulfide	75-15-0	UG/L	n	81	-	81	1.4	-	1.7	2										
Carbon tetrachloride	56-23-5	UG/L	c	0.46	5	0.46	0	-	0	0										
Chlorobenzene	108-90-7	UG/L	n	7.8	100	7.8	1	-	7.2	3			1							
Chloroethane	75-00-3	UG/L	n	2100	-	2100	0	-	0	0										
Chloroform	67-66-3	UG/L	c	0.22	80	0.22	0	-	0	0										
Chloromethane	74-87-3	UG/L	n	19	-	19	0	-	0	0										
cis-1,2-Dichloroethene	156-59-2	UG/L	n	3.6	70	3.6	0.28	-	46	8			9.3							
cis-1,3-Dichloropropene	10061-01-5	UG/L	c	0.47	-	0.47	0	-	0	0										
Cyclohexane	110-82-7	UG/L	n	1300	-	1300	0.31	-	0.31	1										
Dibromochloromethane	124-48-1	UG/L	c	0.87	80	0.87	0	-	0	0										
Dichlorodifluoromethane	75-71-8	UG/L	n	20	-	20	0	-	0	0										
Ethylbenzene	100-41-4	UG/L	c	1.5	700	1.5	1.4	-	1.4	1										
Isopropylbenzene	98-82-8	UG/L	n	45	-	45	0.32	-	0.32	1										
m,p-Xylene	179601-23-	UG/L	n	19	-	19	5.8	-	5.8	1										
Methyl acetate	79-20-9	UG/L	n	2000	-	2000	0	-	0	0										
Methyl tert-butyl ether	1634-04-4	UG/L	c	14	-	14	0.29	-	1.7	5			0.39	J			0.3	J	0.29	J
Methylcyclohexane	108-87-2	UG/L	-	-	-	-	0.38	-	0.38	1										
Methylene chloride	75-09-2	UG/L	c	11	5	5	0	-	0	0										
o-Xylene	95-47-6	UG/L	n	19		19	0.24	-	4.9	2										
Styrene	100-42-5	UG/L	n	120	100	100	0	-	0	0										
Tetrachloroethene	127-18-4	UG/L	n	4.1	5	4.1	0.16	-	0.23	2										
Toluene	108-88-3	UG/L	n	110	1000	110	0.17	-	4.1	6										
trans-1,2-Dichloroethene	156-60-5	UG/L	n	36	100	36	0.25	-	0.25	1										
trans-1,3-Dichloropropene	10061-02-6	UG/L	c	0.47	-	0.47	0	-	0	0										
Trichloroethene	79-01-6	UG/L	n	0.28	5	0.28	0.26	-	7.2	5			1.4							
Trichlorofluoromethane	75-69-4	UG/L	n	520	-	520	0	-	0	0										
Vinyl chloride	75-01-4	UG/L	c	0.019	2	0.019	3.7	-	4.2	2										

Table 4-9b

Volatile Organic Compounds (VOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW08	MW13S	MW14S	MW15S	MW16S	MW17S	MW17S-DUP	MW18S	MW24	MW25	MW26D	MW26S	MW27	MW28	MW29	MW30
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,1,1-Trichloroethane	71-55-6	ug/L	n	800	200	200	0 - 0	0																
1,1,2,2-Tetrachloroethane	79-34-5	ug/L	c	0.076	-	0.076	0 - 0	0																
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ug/L	n	5500	-	5500	0 - 0	0																
1,1,2-Trichloroethane	79-00-5	ug/L	c	0.28	5	0.28	0.12 - 0.12	1										0.12 J						
1,1-Dichloroethane	75-34-3	ug/L	c	2.8	-	2.8	0.2 - 0.27	2		0.2 J														
1,1-Dichloroethene	75-35-4	ug/L	n	28	7	7	0.33 - 0.46	2		0.33 J														
1,2,3-Trichlorobenzene	87-61-6	ug/L	n	0.7	-	0.7	0 - 0	0																
1,2,4-Trichlorobenzene	120-82-1	ug/L	n	0.4	70	0.4	0 - 0	0																
1,2-Dibromo-3-chloropropane	96-12-8	ug/L	c	0.00033	0.2	0.00033	0.23 - 0.23	1																
1,2-Dibromoethane	106-93-4	ug/L	c	0.0075	0.05	0.0075	0 - 0	0																
1,2-Dichlorobenzene	95-50-1	ug/L	n	30	600	30	0.22 - 3.4	2										3.4		0.22 J				
1,2-Dichloroethane	107-06-2	ug/L	c	0.17	5	0.17	1.1 - 1.1	1			1.1													
1,2-Dichloropropane	78-87-5	ug/L	c	0.44	5	0.44	0 - 0	0																
1,3-Dichlorobenzene	541-73-1	ug/L	-	-	-	-	0 - 0	0																
1,4-Dichlorobenzene	106-46-7	ug/L	c	0.48	75	0.48	0.1 - 0.77	7		0.1 J								0.31 J		0.77	0.37 J			
2-Butanone	78-93-3	ug/L	n	560	-	560	6 - 13	2									13	6						
2-Hexanone	591-78-6	ug/L	n	3.8	-	3.8	0 - 0	0																
4-Methyl-2-pentanone	108-10-1	ug/L	n	630	-	630	0 - 0	0																
Acetone	67-64-1	ug/L	n	1400	-	1400	1.5 - 54	14			5.5	3.4 J	13				54	26	5.8	4.2 J	6.3		1.6 J	1.5 J
Benzene	71-43-2	ug/L	c	0.46	5	0.46	0.1 - 5.9	5		0.1 J	0.19 J						0.12 J	5.9						
Bromochloromethane	74-97-5	ug/L	n	8.3	-	8.3	0 - 0	0																
Bromodichloromethane	75-27-4	ug/L	c	0.13	80	0.13	0 - 0	0																
Bromoform	75-25-2	ug/L	c	3.3	80	3.3	0 - 0	0																
Bromomethane	74-83-9	ug/L	n	0.75	-	0.75	0 - 0	0																
Carbon disulfide	75-15-0	ug/L	n	81	-	81	0.089 - 1.3	6				0.15 J	0.3 J				0.36 J	0.16 J						
Carbon tetrachloride	56-23-5	ug/L	c	0.46	5	0.46	0 - 0	0																
Chlorobenzene	108-90-7	ug/L	n	7.8	100	7.8	0.13 - 7.5	10		3.7	1.2	0.22 J	0.4 J					1.2		1.6	1.5			
Chloroethane	75-00-3	ug/L	n	2100	-	2100	0 - 0	0																
Chloroform	67-66-3	ug/L	c	0.22	80	0.22	0.17 - 0.17	1																
Chloromethane	74-87-3	ug/L	n	19	-	19	0.14 - 0.14	1					0.14 J											
cis-1,2-Dichloroethene	156-59-2	ug/L	n	3.6	70	3.6	0.073 - 94	12	2	53	0.26 J						0.38 J	0.55		0.073 J	0.18 J			
cis-1,3-Dichloropropene	10061-01-5	ug/L	c	0.47	-	0.47	0 - 0	0																
Cyclohexane	110-82-7	ug/L	n	1300	-	1300	0 - 0	0																
Dibromochloromethane	124-48-1	ug/L	c	0.87	80	0.87	0 - 0	0																
Dichlorodifluoromethane	75-71-8	ug/L	n	20	-	20	0 - 0	0																
Ethylbenzene	100-41-4	ug/L	c	1.5	700	1.5	3.5 - 3.5	1										3.5						
Isopropylbenzene	98-82-8	ug/L	n	45	-	45	0.63 - 0.63	1										0.63						
m,p-Xylene	179601-23-1	ug/L	n	19	-	19	16 - 16	1										16						
Methyl acetate	79-20-9	ug/L	n	2000	-	2000	0 - 0	0																
Methyl tert-Butyl Ether	1634-04-4	ug/L	c	14	-	14	0.11 - 2.6	14		1.2			0.48 J	0.27 J		0.29 J	0.48 J	1.1	2.2		0.56	0.48 J		
Methylcyclohexane	108-87-2	ug/L	-	-	-	-	0.35 - 0.35	1										0.35 J						
Methylene chloride	75-09-2	ug/L	c	11	5	5	0 - 0	0																
o-Xylene	95-47-6	ug/L	n	19		19	13 - 13	1										13						
Styrene	100-42-5	ug/L	n	120	100	100	0 - 0	0																
Tetrachloroethene	127-18-4	ug/L	n	4.1	5	4.1	0.16 - 0.57	2	0.57															
Toluene	108-88-3	ug/L	n	110	1000	110	0.093 - 9.3	2									0.093 J	9.3						
trans-1,2-Dichloroethene	156-60-5	ug/L	n	36	100	36	0.2 - 0.4	3	0.2 J	0.24 J														
trans-1,3-Dichloropropene	10061-02-6	ug/L	c	0.47	-	0.47	0 - 0	0																
Trichloroethene	79-01-6	ug/L	n	0.28	5	0.28	0.16 - 14	5		4.5								0.18 J						
Trichlorofluoromethane	75-69-4	ug/L	n	520	-	520	0 - 0	0																
Vinyl chloride	75-01-4	ug/L	c	0.019	2	0.019	0.14 - 2.2	6	0.25 J	1.8 J								1.8		0.14 J				

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL)

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample

Table 4-9b

Volatile Organic Compounds (VOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW31	MW32	MW33	MW35	MW38	MW39	MW40	MW41D	MW41D-DUP	MW41S	MW42	MW43	MW44	MW46	MW47	MW47-DUP
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,1,1-Trichloroethane	71-55-6	ug/L	n	800	200	200	0 - 0	0																
1,1,2,2-Tetrachloroethane	79-34-5	ug/L	c	0.076	-	0.076	0 - 0	0																
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ug/L	n	5500	-	5500	0 - 0	0																
1,1,2-Trichloroethane	79-00-5	ug/L	c	0.28	5	0.28	0.12 - 0.12	1																
1,1-Dichloroethane	75-34-3	ug/L	c	2.8	-	2.8	0.2 - 0.27	2					0.27 J											
1,1-Dichloroethene	75-35-4	ug/L	n	28	7	7	0.33 - 0.46	2					0.46 J											
1,2,3-Trichlorobenzene	87-61-6	ug/L	n	0.7	-	0.7	0 - 0	0																
1,2,4-Trichlorobenzene	120-82-1	ug/L	n	0.4	70	0.4	0 - 0	0																
1,2-Dibromo-3-chloropropane	96-12-8	ug/L	c	0.00033	0.2	0.00033	0.23 - 0.23	1						0.23 J										
1,2-Dibromoethane	106-93-4	ug/L	c	0.0075	0.05	0.0075	0 - 0	0																
1,2-Dichlorobenzene	95-50-1	ug/L	n	30	600	30	0.22 - 3.4	2																
1,2-Dichloroethane	107-06-2	ug/L	c	0.17	5	0.17	1.1 - 1.1	1																
1,2-Dichloropropane	78-87-5	ug/L	c	0.44	5	0.44	0 - 0	0																
1,3-Dichlorobenzene	541-73-1	ug/L	-	-	-	-	0 - 0	0																
1,4-Dichlorobenzene	106-46-7	ug/L	c	0.48	75	0.48	0.1 - 0.77	7					0.26 J			0.16 J	0.16 J							
2-Butanone	78-93-3	ug/L	n	560	-	560	6 - 13	2																
2-Hexanone	591-78-6	ug/L	n	3.8	-	3.8	0 - 0	0																
4-Methyl-2-pentanone	108-10-1	ug/L	n	630	-	630	0 - 0	0																
Acetone	67-64-1	ug/L	n	1400	-	1400	1.5 - 54	14	2.5 J	2.3 J										3.1 J		2 J		
Benzene	71-43-2	ug/L	c	0.46	5	0.46	0.1 - 5.9	5					0.27 J											
Bromochloromethane	74-97-5	ug/L	n	8.3	-	8.3	0 - 0	0																
Bromodichloromethane	75-27-4	ug/L	c	0.13	80	0.13	0 - 0	0																
Bromoform	75-25-2	ug/L	c	3.3	80	3.3	0 - 0	0																
Bromomethane	74-83-9	ug/L	n	0.75	-	0.75	0 - 0	0																
Carbon disulfide	75-15-0	ug/L	n	81	-	81	0.089 - 1.3	6					0.089 J					1.3						
Carbon tetrachloride	56-23-5	ug/L	c	0.46	5	0.46	0 - 0	0																
Chlorobenzene	108-90-7	ug/L	n	7.8	100	7.8	0.13 - 7.5	10					7.5			0.13 J	0.14 J							
Chloroethane	75-00-3	ug/L	n	2100	-	2100	0 - 0	0																
Chloroform	67-66-3	ug/L	c	0.22	80	0.22	0.17 - 0.17	1						0.17 J										
Chloromethane	74-87-3	ug/L	n	19	-	19	0.14 - 0.14	1																
cis-1,2-Dichloroethene	156-59-2	ug/L	n	3.6	70	3.6	0.073 - 94	12			0.85		94	0.17 J							0.13 J	0.23 J		
cis-1,3-Dichloropropene	10061-01-5	ug/L	c	0.47	-	0.47	0 - 0	0																
Cyclohexane	110-82-7	ug/L	n	1300	-	1300	0 - 0	0																
Dibromochloromethane	124-48-1	ug/L	c	0.87	80	0.87	0 - 0	0																
Dichlorodifluoromethane	75-71-8	ug/L	n	20	-	20	0 - 0	0																
Ethylbenzene	100-41-4	ug/L	c	1.5	700	1.5	3.5 - 3.5	1																
Isopropylbenzene	98-82-8	ug/L	n	45	-	45	0.63 - 0.63	1																
m,p-Xylene	179601-23-1	ug/L	n	19	-	19	16 - 16	1																
Methyl acetate	79-20-9	ug/L	n	2000	-	2000	0 - 0	0																
Methyl tert-Butyl Ether	1634-04-4	ug/L	c	14	-	14	0.11 - 2.6	14					2.6				0.11 J			0.53		1.1	0.36 J	
Methylcyclohexane	108-87-2	ug/L	-	-	-	-	0.35 - 0.35	1																
Methylene chloride	75-09-2	ug/L	c	11	5	5	0 - 0	0																
o-Xylene	95-47-6	ug/L	n	19		19	13 - 13	1																
Styrene	100-42-5	ug/L	n	120	100	100	0 - 0	0																
Tetrachloroethene	127-18-4	ug/L	n	4.1	5	4.1	0.16 - 0.57	2			0.16 J													
Toluene	108-88-3	ug/L	n	110	1000	110	0.093 - 9.3	2																
trans-1,2-Dichloroethene	156-60-5	ug/L	n	36	100	36	0.2 - 0.4	3					0.4 J											
trans-1,3-Dichloropropene	10061-02-6	ug/L	c	0.47	-	0.47	0 - 0	0																
Trichloroethene	79-01-6	ug/L	n	0.28	5	0.28	0.16 - 14	5			0.41 J		14	0.16 J										
Trichlorofluoromethane	75-69-4	ug/L	n	520	-	520	0 - 0	0																
Vinyl chloride	75-01-4	ug/L	c	0.019	2	0.019	0.14 - 2.2	6					2.2									0.2 J		

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Co

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical valu
Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample

Table 4-9c

Volatile Organic Compounds (VOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	Units	RSL*	MCL**	Screening Value	Range	Frequency	MW08	MW13S	MW14S	MW15S	MW16S	MW24	MW25	MW26D	MW26S	MW27	MW38	MW39	MW41D	MW41S	MW46
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,1,1-Trichloroethane	71-55-6	n	UG/L	800	200	200	0 - 0	0															
1,1,2,2-Tetrachloroethane	79-34-5	c	UG/L	0.076	-	0.076	0 - 0	0															
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	n	UG/L	5500	-	5500	0 - 0	0															
1,1,2-Trichloroethane	79-00-5	c	UG/L	0.28	5	0.28	0 - 0	0															
1,1-Dichloroethane	75-34-3	c	UG/L	2.8	-	2.8	0 - 0	0															
1,1-Dichloroethene	75-35-4	n	UG/L	28	7	7	0.3 - 0.44	2		0.3 J									0.44 J				
1,2,3-Trichlorobenzene	87-61-6	n	UG/L	0.7	-	0.7	0 - 0	0															
1,2,4-Trichlorobenzene	120-82-1	n	UG/L	0.4	70	0.4	0 - 0	0															
1,2-Dibromo-3-chloropropane	96-12-8	c	UG/L	0.00033	0.2	0.00033	0 - 0	0															
1,2-Dibromoethane(EDB)	106-93-4	c	UG/L	0.0075	0.05	0.0075	0 - 0	0															
1,2-Dichlorobenzene	95-50-1	n	UG/L	30	600	30	0.3 - 4.2	2							4.2		0.3 J						
1,2-Dichloroethane	107-06-2	c	UG/L	0.17	5	0.17	0 - 0	0															
1,2-Dichloropropane	78-87-5	c	UG/L	0.44	5	0.44	0 - 0	0															
1,3-Dichlorobenzene	541-73-1	-	UG/L	-	-	-	0 - 0	0															
1,4-Dichlorobenzene	106-46-7	c	UG/L	0.48	75	0.48	0.41 - 0.92	3							0.61		0.92	0.41 J					
2-Butanone	78-93-3	n	UG/L	560	-	560	0 - 0	0															
2-Hexanone	591-78-6	n	UG/L	3.8	-	3.8	0 - 0	0															
4-Methyl-2-pentanone	108-10-1	n	UG/L	630	-	630	0 - 0	0															
Acetone	67-64-1	n	UG/L	1400	-	1400	13 - 13	1						13									
Benzene	71-43-2	c	UG/L	0.46	5	0.46	3.5 - 3.5	1							3.5								
Bromochloromethane	74-97-5	n	UG/L	8.3	-	8.3	0 - 0	0															
Bromodichloromethane	75-27-4	c	UG/L	0.13	80	0.13	0 - 0	0															
Bromoform	75-25-2	c	UG/L	3.3	80	3.3	0 - 0	0															
Bromomethane	74-83-9	n	UG/L	0.75	-	0.75	0 - 0	0															
Carbon disulfide	75-15-0	n	UG/L	81	-	81	0.22 - 0.22	1						0.22 J									
Carbon tetrachloride	56-23-5	c	UG/L	0.46	5	0.46	0 - 0	0															
Chlorobenzene	108-90-7	n	UG/L	7.8	100	7.8	0.43 - 5.8	8		0.48 J	1.1	0.89	0.43 J		2.9		1.3	1.4	5.8				
Chloroethane	75-00-3	n	UG/L	2100	-	2100	0 - 0	0															
Chloroform	67-66-3	c	UG/L	0.22	80	0.22	0 - 0	0															
Chloromethane	74-87-3	n	UG/L	19	-	19	0 - 0	0															
cis-1,2-Dichloroethene	156-59-2	n	UG/L	3.6	70	3.6	0.24 - 42	6	1.6	12	0.24 J			0.31 J					42	3.4			
cis-1,3-Dichloropropene	10061-01-5	c	UG/L	0.47	-	0.47	0 - 0	0															
Cyclohexane	110-82-7	n	UG/L	1300	-	1300	4.2 - 4.2	1							4.2								
Dibromochloromethane	124-48-1	c	UG/L	0.87	80	0.87	0 - 0	0															
Dichlorodifluoromethane	75-71-8	n	UG/L	20	-	20	0 - 0	0															
Ethylbenzene	100-41-4	c	UG/L	1.5	700	1.5	3.4 - 3.4	1							3.4								
Isopropylbenzene (Cumene)	98-82-8	n	UG/L	45	-	45	2.1 - 2.1	1							2.1								
m,p-Xylene	179601-23-1	n	UG/L	19	-	19	26 - 26	1							26								
Methyl Acetate	79-20-9	n	UG/L	2000	-	2000	0 - 0	0															
Methyl tert-butyl ether	1634-04-4	c	UG/L	14	-	14	0.46 - 1.7	7					0.52	0.61	1.1	1.7		0.6	1.7				0.46 J
Methylcyclohexane	108-87-2	-	UG/L	-	-	-	3.8 - 3.8	1							3.8								
Methylene chloride	75-09-2	c	UG/L	11	5	5	0 - 0	0															
o-Xylene	95-47-6	n	UG/L	19		19	0.21 - 11	2						0.21 J	11								
Styrene	100-42-5	n	UG/L	120	100	100	0 - 0	0															
Tetrachloroethene	127-18-4	n	UG/L	4.1	5	4.1	0.65 - 0.65	1	0.65														
Toluene	108-88-3	n	UG/L	110	1000	110	4.8 - 4.8	1							4.8								
trans-1,2-Dichloroethene	156-60-5	n	UG/L	36	100	36	0.51 - 0.51	1											0.51				
trans-1,3-Dichloropropene	10061-02-6	c	UG/L	0.47	-	0.47	0 - 0	0															
Trichloroethene	79-01-6	n	UG/L	0.28	5	0.28	0.27 - 8.4	4	0.27 J	5.6									8.4	0.79			
Trichlorofluoromethane	75-69-4	n	UG/L	520	-	520	0 - 0	0															
Vinyl chloride	75-01-4	c	UG/L	0.019	2	0.019	2.8 - 2.8	1											2.8				

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-9d

Volatile Organic Compounds (VOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (April 2016)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	Units	RSL*	MCL**	Screening Value	Range			Frequency	MW13S		MW24		MW25		MW26D		MW26S		MW27		MW33		MW38		MW39	
											Result		Result		Result		Result		Result		Result		Result		Result		Result	
1,1,1-Trichloroethane	71-55-6	n	UG/L	800	200	200	0	-	0	0																		
1,1,2,2-Tetrachloroethane	79-34-5	c	UG/L	0.076	-	0.076	0	-	0	0																		
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	n	UG/L	5500	-	5500	0	-	0	0																		
1,1,2-Trichloroethane	79-00-5	c	UG/L	0.28	5	0.28	0	-	0	0																		
1,1-Dichloroethane	75-34-3	c	UG/L	2.8	-	2.8	0.11	-	0.11	1															0.11	J		
1,1-Dichloroethene	75-35-4	n	UG/L	28	7	7	0	-	0	0																		
1,2,3-Trichlorobenzene	87-61-6	n	UG/L	0.7	-	0.7	0	-	0	0																		
1,2,4-Trichlorobenzene	120-82-1	n	UG/L	0.4	70	0.4	0	-	0	0																		
1,2-Dibromo-3-chloropropane	96-12-8	c	UG/L	0.00033	0.2	0.00033	0	-	0	0																		
1,2-Dibromoethane(EDB)	106-93-4	c	UG/L	0.0075	0.05	0.0075	0	-	0	0																		
1,2-Dichlorobenzene	95-50-1	n	UG/L	30	600	30	0.33	-	4.7	2					4.7				0.33	J								
1,2-Dichloroethane	107-06-2	c	UG/L	0.17	5	0.17	0	-	0	0																		
1,2-Dichloropropane	78-87-5	c	UG/L	0.44	5	0.44	0	-	0	0																		
1,3-Dichlorobenzene	541-73-1	-	UG/L	-	-	-	0.18	-	0.18	1					0.18	J												
1,4-Dichlorobenzene	106-46-7	c	UG/L	0.48	75	0.48	0.32	-	0.83	3					0.76				0.83		0.32	J						
2-Butanone	78-93-3	n	UG/L	560	-	560	0	-	0	0																		
2-Hexanone	591-78-6	n	UG/L	3.8	-	3.8	5.6	-	5.6	1					5.6	J+												
4-Methyl-2-pentanone	108-10-1	n	UG/L	630	-	630	0	-	0	0																		
Acetone	67-64-1	n	UG/L	1400	-	1400	5.1	-	7	4					7		5.8		6.2	J+					5.1			
Benzene	71-43-2	c	UG/L	0.46	5	0.46	5.8	-	5.8	1					5.8													
Bromochloromethane	74-97-5	n	UG/L	8.3	-	8.3	0	-	0	0																		
Bromodichloromethane	75-27-4	c	UG/L	0.13	80	0.13	0	-	0	0																		
Bromoform	75-25-2	c	UG/L	3.3	80	3.3	0	-	0	0																		
Bromomethane	74-83-9	n	UG/L	0.75	-	0.75	0	-	0	0																		
Carbon disulfide	75-15-0	n	UG/L	81	-	81	0.22	-	0.22	1											0.22	J						
Carbon tetrachloride	56-23-5	c	UG/L	0.46	5	0.46	0	-	0	0																		
Chlorobenzene	108-90-7	n	UG/L	7.8	100	7.8	0.66	-	3.9	4					3.9				1.5		1				0.66			
Chloroethane	75-00-3	n	UG/L	2100	-	2100	0	-	0	0																		
Chloroform	67-66-3	c	UG/L	0.22	80	0.22	0	-	0	0																		
Chloromethane	74-87-3	n	UG/L	19	-	19	0	-	0	0																		
cis-1,2-Dichloroethene	156-59-2	n	UG/L	3.6	70	3.6	0.11	-	54	7	0.46	J-	0.16	J	0.21	J					0.13	J	0.11	J	54	J-	4.4	J-
cis-1,3-Dichloropropene	10061-01-5	c	UG/L	0.47	-	0.47	0	-	0	0																		
Cyclohexane	110-82-7	n	UG/L	1300	-	1300	4	-	4	1					4													
Dibromochloromethane	124-48-1	c	UG/L	0.87	80	0.87	0	-	0	0																		
Dichlorodifluoromethane	75-71-8	n	UG/L	20	-	20	0	-	0	0																		
Ethylbenzene	100-41-4	c	UG/L	1.5	700	1.5	4.4	-	4.4	1					4.4													
Isopropylbenzene (Cumene)	98-82-8	n	UG/L	45	-	45	2.3	-	2.3	1					2.3													
m,p-Xylene	179601-23-1	n	UG/L	19	-	19	18	-	18	1					18													
Methyl Acetate	79-20-9	n	UG/L	2000	-	2000	0	-	0	0																		
Methyl tert-butyl ether	1634-04-4	c	UG/L	14	-	14	3	-	3	1					3													
Methylcyclohexane	108-87-2	-	UG/L	-	-	-	0.17	-	1.2	4			0.41	J			1.2				0.48	J			0.17	J		
Methylene chloride	75-09-2	c	UG/L	11	5	5	0	-	0	0																		
o-Xylene	95-47-6	n	UG/L	19		19	0.14	-	15	2			0.14	J	15													
Styrene	100-42-5	n	UG/L	120	100	100	0	-	0	0																		
Tetrachloroethene	127-18-4	n	UG/L	4.1	5	4.1	0.65	-	0.65	1	0.65																	
Toluene	108-88-3	n	UG/L	110	1000	110	0.11	-	7	2			0.11	J	7													
trans-1,2-Dichloroethene	156-60-5	n	UG/L	36	100	36	0.11	-	0.2	2					0.11	J									0.2	J		
trans-1,3-Dichloropropene	10061-02-6	c	UG/L	0.47	-	0.47	0	-	0	0																		
Trichloroethene	79-01-6	n	UG/L	0.28	5	0.28	0.12	-	6.2	3	0.12	J-													6.2		0.86	
Trichlorofluoromethane	75-69-4	n	UG/L	520	-	520	0	-	0	0																		
Vinyl chloride	75-01-4	c	UG/L	0.019	2	0.019	0.25	-	0.4	2					0.25	J									0.4	J		

* USEPA Region III Regional Screening Level (RSL), May 2016

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-10a

Semivolatile Organic Compounds (SVOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW08		MW13S		MW14S		MW15S		MW16S		MW17S		MW17S-DUP		MW18S		MW24		MW25		MW26D		MW26S	
											03/24/14		03/24/14		03/24/14		03/05/14		03/06/14		03/06/14		03/06/14		03/10/14		03/21/14		03/21/14		03/07/14		03/07/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1'-Biphenyl	92-52-4	UG/L	n	0.083	-	0.083	0	-	0	0																								
1,2,4,5-Tetrachlorobenzene	95-94-3	UG/L	n	0.17	-	0.17	0	-	0	0																								
1,4-Dioxane	123-91-1	UG/L	c	0.46	-	0.46	2.6	-	260	15					5.1				25								12							
2,2'-Oxybis(1-chloropropane)	108-60-1	UG/L	n	71	-	71	0	-	0	0																								
2,3,4,6-Tetrachlorophenol	58-90-2	UG/L	n	24	-	24	0	-	0	0																								
2,4,5-Trichlorophenol	95-95-4	UG/L	n	120	-	120	0	-	0	0																								
2,4,6-Trichlorophenol	88-06-2	UG/L	n	1.2	-	1.2	0	-	0	0																								
2,4-Dichlorophenol	120-83-2	UG/L	n	4.6	-	4.6	0	-	0	0																								
2,4-Dimethylphenol	105-67-9	UG/L	n	36	-	36	4.3	-	4.3	1																			4.3	J				
2,4-Dinitrophenol	51-28-5	UG/L	n	3.9	-	3.9	0	-	0	0																								
2,4-Dinitrotoluene	121-14-2	UG/L	c	0.24	-	0.24	0	-	0	0																								
2,6-Dinitrotoluene	606-20-2	UG/L	c	0.049	-	0.049	0	-	0	0																								
2-Chloronaphthalene	91-58-7	UG/L	n	75	-	75	0	-	0	0																								
2-Chlorophenol	95-57-8	UG/L	n	9.1	-	9.1	0	-	0	0																								
2-Methylnaphthalene	91-57-6	UG/L	n	3.6	-	3.6	0.098	-	0.098	1																			0.098	J				
2-Methylphenol	95-48-7	UG/L	n	93	-	93	0	-	0	0																								
2-Nitroaniline	88-74-4	UG/L	n	19	-	19	0	-	0	0																								
2-Nitrophenol	88-75-5	UG/L	-	-	-	-	0	-	0	0																								
3,3'-Dichlorobenzidine	91-94-1	UG/L	c	0.13	-	0.13	0	-	0	0																								
3-Nitroaniline	99-09-2	UG/L	-	-	-	-	0	-	0	0																								
4,6-Dinitro-2-methylphenol	534-52-1	UG/L	n	0.15	-	0.15	0	-	0	0																								
4-Bromophenyl-phenylether	101-55-3	UG/L	-	-	-	-	0	-	0	0																								
4-Chloro-3-methylphenol	59-50-7	UG/L	n	140	-	140	0	-	0	0																								
4-Chloroaniline	106-47-8	UG/L	c	0.37	-	0.37	0	-	0	0																								
4-Chlorophenyl-phenylether	7005-72-3	UG/L	-	-	-	-	0	-	0	0																								
4-Methylphenol	106-44-5	UG/L	n	190	-	190	0	-	0	0																								
4-Nitroaniline	100-01-6	UG/L	c	3.8	-	3.8	0	-	0	0																								
4-Nitrophenol	100-02-7	UG/L	-	-	-	-	0	-	0	0																								
Acenaphthene	83-32-9	UG/L	n	53	-	53	0.43	-	0.43	1																								
Acenaphthylene	208-96-8	UG/L	-	-	-	-	0	-	0	0																								
Acetophenone	98-86-2	UG/L	n	190	-	190	0	-	0	0																								
Anthracene	120-12-7	UG/L	n	180	-	180	0	-	0	0																								
Atrazine	1912-24-9	UG/L	c	0.3	3	0.3	0	-	0	0																								
Benzaldehyde	100-52-7	UG/L	n	190	-	190	0	-	0	0																								
Benzo(a)anthracene	56-55-3	UG/L	c	0.012	-	0.012	0	-	0	0																								
Benzo(a)pyrene	50-32-8	UG/L	c	0.0034	0.2	0.0034	0	-	0	0																								
Benzo(b)fluoranthene	205-99-2	UG/L	c	0.034	-	0.034	0	-	0	0																								
Benzo(g,h,i)perylene	191-24-2	UG/L	-	-	-	-	0	-	0	0																								
Benzo(k)fluoranthene	207-08-9	UG/L	c	0.34	-	0.34	0	-	0	0																								
Bis(2-chloroethoxy)methane	111-91-1	UG/L	n	5.9	-	5.9	0	-	0	0																								
Bis(2-chloroethyl)ether	111-44-4	UG/L	c	0.014	-	0.014	0	-	0	0																								
Bis(2-ethylhexyl)phthalate	117-81-7	UG/L	c	5.6	6	5.6	2.1	-	4.9	2											2.1	J											4.9	J
Butylbenzylphthalate	85-68-7	UG/L	c	16	-	16	0	-	0	0																								
Caprolactam	105-60-2	UG/L	n	990	-	990	0	-	0	0																								
Carbazole	86-74-8	UG/L	-	-	-	-	2.5	-	2.5	1																								
Chrysene	218-01-9	UG/L	c	3.4	-	3.4	0	-	0	0																								
Dibenzo(a,h)anthracene	53-70-3	UG/L	c	0.0034	-	0.0034	0	-	0	0																								

Semivolatile Organic Compounds (SVOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW08		MW13S		MW14S		MW15S		MW16S		MW17S		MW17S-DUP		MW18S		MW24		MW25		MW26D		MW26S	
											03/24/14		03/24/14		03/24/14		03/05/14		03/06/14		03/06/14		03/06/14		03/10/14		03/21/14		03/21/14		03/07/14		03/07/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Dibenzofuran	132-64-9	UG/L	n	0.79	-	0.79	0	-	0	0																								
Diethylphthalate	84-66-2	UG/L	n	1500	-	1500	2	-	23	3																								
Dimethylphthalate	131-11-3	UG/L	-	-	-	-	0	-	0	0																								
Di-n-butylphthalate	84-74-2	UG/L	n	90	-	90	0	-	0	0																								
Di-n-octylphthalate	117-84-0	UG/L	n	20	-	20	0	-	0	0																								
Fluoranthene	206-44-0	UG/L	n	80	-	80	0.11	-	0.11	1																	0.11							
Fluorene	86-73-7	UG/L	n	29	-	29	0.12	-	0.12	1																	0.12							
Hexachlorobenzene	118-74-1	UG/L	c	0.0098	1	0.0098	0	-	0	0																								
Hexachlorobutadiene	87-68-3	UG/L	c	0.14	-	0.14	0	-	0	0																								
Hexachlorocyclopentadiene	77-47-4	UG/L	n	0.041	50	0.041	0	-	0	0																								
Hexachloroethane	67-72-1	UG/L	c	0.33	-	0.33	0	-	0	0																								
Indeno(1,2,3-cd)pyrene	193-39-5	UG/L	c	0.034	-	0.034	0	-	0	0																								
Isophorone	78-59-1	UG/L	c	78	-	78	0	-	0	0																								
Naphthalene	91-20-3	UG/L	c	0.17	-	0.17	0.1	-	0.1	1																			0.1					
Nitrobenzene	98-95-3	UG/L	c	0.14	-	0.14	0	-	0	0																								
N-Nitroso-di-n-propylamine	621-64-7	UG/L	c	0.011	-	0.011	0	-	0	0																								
N-Nitrosodiphenylamine	86-30-6	UG/L	c	12	-	12	0	-	0	0																								
Pentachlorophenol	87-86-5	UG/L	c	0.041	1	0.041	0.18	-	0.18	1																			0.18	J				
Phenanthrene	85-01-8	UG/L	-	-	-	-	0.11	-	0.11	2											0.11										0.11			
Phenol	108-95-2	UG/L	n	580	-	580	0	-	0	0																								
Pyrene	129-00-0	UG/L	n	12	-	12	0.17	-	0.17	1																	0.17							

Semivolatile Organic Compounds (SVOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW27		MW28		MW29		MW30		MW31		MW32		MW33		MW35		MW38		MW39		MW40		MW41D		MW41D-DUP		MW41S	
							03/11/14		03/12/14		03/14/14		03/14/14		03/13/14		03/14/14		03/20/14		03/12/14		03/19/14		03/24/14		03/12/14		03/18/14		03/18/14		03/18/14	
							Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1'-Biphenyl	92-52-4	UG/L	n	0.083	-	0.083																												
1,2,4,5-Tetrachlorobenzene	95-94-3	UG/L	n	0.17	-	0.17																												
1,4-Dioxane	123-91-1	UG/L	c	0.46	-	0.46			22				17				12						26		4.4				260		260			
2,2'-Oxybis(1-chloropropane)	108-60-1	UG/L	n	71	-	71																												
2,3,4,6-Tetrachlorophenol	58-90-2	UG/L	n	24	-	24																												
2,4,5-Trichlorophenol	95-95-4	UG/L	n	120	-	120																												
2,4,6-Trichlorophenol	88-06-2	UG/L	n	1.2	-	1.2																												
2,4-Dichlorophenol	120-83-2	UG/L	n	4.6	-	4.6																												
2,4-Dimethylphenol	105-67-9	UG/L	n	36	-	36																												
2,4-Dinitrophenol	51-28-5	UG/L	n	3.9	-	3.9																												
2,4-Dinitrotoluene	121-14-2	UG/L	c	0.24	-	0.24																												
2,6-Dinitrotoluene	606-20-2	UG/L	c	0.049	-	0.049																												
2-Chloronaphthalene	91-58-7	UG/L	n	75	-	75																												
2-Chlorophenol	95-57-8	UG/L	n	9.1	-	9.1																												
2-Methylnaphthalene	91-57-6	UG/L	n	3.6	-	3.6																												
2-Methylphenol	95-48-7	UG/L	n	93	-	93																												
2-Nitroaniline	88-74-4	UG/L	n	19	-	19																												
2-Nitrophenol	88-75-5	UG/L	-	-	-	-																												
3,3'-Dichlorobenzidine	91-94-1	UG/L	c	0.13	-	0.13																												
3-Nitroaniline	99-09-2	UG/L	-	-	-	-																												
4,6-Dinitro-2-methylphenol	534-52-1	UG/L	n	0.15	-	0.15																												
4-Bromophenyl-phenylether	101-55-3	UG/L	-	-	-	-																												
4-Chloro-3-methylphenol	59-50-7	UG/L	n	140	-	140																												
4-Chloroaniline	106-47-8	UG/L	c	0.37	-	0.37																												
4-Chlorophenyl-phenylether	7005-72-3	UG/L	-	-	-	-																												
4-Methylphenol	106-44-5	UG/L	n	190	-	190																												
4-Nitroaniline	100-01-6	UG/L	c	3.8	-	3.8																												
4-Nitrophenol	100-02-7	UG/L	-	-	-	-																												
Acenaphthene	83-32-9	UG/L	n	53	-	53																	0.43											
Acenaphthylene	208-96-8	UG/L	-	-	-	-																												
Acetophenone	98-86-2	UG/L	n	190	-	190																												
Anthracene	120-12-7	UG/L	n	180	-	180																												
Atrazine	1912-24-9	UG/L	c	0.3	3	0.3																												
Benzaldehyde	100-52-7	UG/L	n	190	-	190																												
Benzo(a)anthracene	56-55-3	UG/L	c	0.012	-	0.012																												
Benzo(a)pyrene	50-32-8	UG/L	c	0.0034	0.2	0.0034																												
Benzo(b)fluoranthene	205-99-2	UG/L	c	0.034	-	0.034																												
Benzo(g,h,i)perylene	191-24-2	UG/L	-	-	-	-																												
Benzo(k)fluoranthene	207-08-9	UG/L	c	0.34	-	0.34																												
Bis(2-chloroethoxy)methane	111-91-1	UG/L	n	5.9	-	5.9																												
Bis(2-chloroethyl)ether	111-44-4	UG/L	c	0.014	-	0.014																												
Bis(2-ethylhexyl)phthalate	117-81-7	UG/L	c	5.6	6	5.6																												
Butylbenzylphthalate	85-68-7	UG/L	c	16	-	16																												
Caprolactam	105-60-2	UG/L	n	990	-	990																												
Carbazole	86-74-8	UG/L	-	-	-	-																												
Chrysene	218-01-9	UG/L	c	3.4	-	3.4																												
Dibenzo(a,h)anthracene	53-70-3	UG/L	c	0.0034	-	0.0034																												

Table 4-10a

Semivolatile Organic Compounds (SVOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW27		MW28		MW29		MW30		MW31		MW32		MW33		MW35		MW38		MW39		MW40		MW41D		MW41D-DUP		MW41S	
							03/11/14		03/12/14		03/14/14		03/14/14		03/13/14		03/14/14		03/20/14		03/12/14		03/19/14		03/24/14		03/12/14		03/18/14		03/18/14		03/18/14	
							Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Dibenzofuran	132-64-9	UG/L	n	0.79	-	0.79																												
Diethylphthalate	84-66-2	UG/L	n	1500	-	1500									23												13							
Dimethylphthalate	131-11-3	UG/L	-	-	-	-																												
Di-n-butylphthalate	84-74-2	UG/L	n	90	-	90																												
Di-n-octylphthalate	117-84-0	UG/L	n	20	-	20																												
Fluoranthene	206-44-0	UG/L	n	80	-	80																												
Fluorene	86-73-7	UG/L	n	29	-	29																												
Hexachlorobenzene	118-74-1	UG/L	c	0.0098	1	0.0098																												
Hexachlorobutadiene	87-68-3	UG/L	c	0.14	-	0.14																												
Hexachlorocyclopentadiene	77-47-4	UG/L	n	0.041	50	0.041																												
Hexachloroethane	67-72-1	UG/L	c	0.33	-	0.33																												
Indeno(1,2,3-cd)pyrene	193-39-5	UG/L	c	0.034	-	0.034																												
Isophorone	78-59-1	UG/L	c	78	-	78																												
Naphthalene	91-20-3	UG/L	c	0.17	-	0.17																												
Nitrobenzene	98-95-3	UG/L	c	0.14	-	0.14																												
N-Nitroso-di-n-propylamine	621-64-7	UG/L	c	0.011	-	0.011																												
N-Nitrosodiphenylamine	86-30-6	UG/L	c	12	-	12																												
Pentachlorophenol	87-86-5	UG/L	c	0.041	1	0.041																												
Phenanthrene	85-01-8	UG/L	-	-	-	-																												
Phenol	108-95-2	UG/L	n	580	-	580																												
Pyrene	129-00-0	UG/L	n	12	-	12																												

Table 4-10a
Semivolatile Organic Compounds (SVOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW42		MW43		MW44		MW45		MW46		MW47		MW47-DUP	
							03/20/14		03/12/14		03/20/14		03/21/14		03/12/14		03/21/14		03/21/14	
							Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1'-Biphenyl	92-52-4	UG/L	n	0.083	-	0.083														
1,2,4,5-Tetrachlorobenzene	95-94-3	UG/L	n	0.17	-	0.17														
1,4-Dioxane	123-91-1	UG/L	c	0.46	-	0.46	2.6		4.7				8.8				8.9		13	
2,2'-Oxybis(1-chloropropane)	108-60-1	UG/L	n	71	-	71														
2,3,4,6-Tetrachlorophenol	58-90-2	UG/L	n	24	-	24														
2,4,5-Trichlorophenol	95-95-4	UG/L	n	120	-	120														
2,4,6-Trichlorophenol	88-06-2	UG/L	n	1.2	-	1.2														
2,4-Dichlorophenol	120-83-2	UG/L	n	4.6	-	4.6														
2,4-Dimethylphenol	105-67-9	UG/L	n	36	-	36														
2,4-Dinitrophenol	51-28-5	UG/L	n	3.9	-	3.9														
2,4-Dinitrotoluene	121-14-2	UG/L	c	0.24	-	0.24														
2,6-Dinitrotoluene	606-20-2	UG/L	c	0.049	-	0.049														
2-Chloronaphthalene	91-58-7	UG/L	n	75	-	75														
2-Chlorophenol	95-57-8	UG/L	n	9.1	-	9.1														
2-Methylnaphthalene	91-57-6	UG/L	n	3.6	-	3.6														
2-Methylphenol	95-48-7	UG/L	n	93	-	93														
2-Nitroaniline	88-74-4	UG/L	n	19	-	19														
2-Nitrophenol	88-75-5	UG/L	-	-	-	-														
3,3'-Dichlorobenzidine	91-94-1	UG/L	c	0.13	-	0.13														
3-Nitroaniline	99-09-2	UG/L	-	-	-	-														
4,6-Dinitro-2-methylphenol	534-52-1	UG/L	n	0.15	-	0.15														
4-Bromophenyl-phenylether	101-55-3	UG/L	-	-	-	-														
4-Chloro-3-methylphenol	59-50-7	UG/L	n	140	-	140														
4-Chloroaniline	106-47-8	UG/L	c	0.37	-	0.37														
4-Chlorophenyl-phenylether	7005-72-3	UG/L	-	-	-	-														
4-Methylphenol	106-44-5	UG/L	n	190	-	190														
4-Nitroaniline	100-01-6	UG/L	c	3.8	-	3.8														
4-Nitrophenol	100-02-7	UG/L	-	-	-	-														
Acenaphthene	83-32-9	UG/L	n	53	-	53														
Acenaphthylene	208-96-8	UG/L	-	-	-	-														
Acetophenone	98-86-2	UG/L	n	190	-	190														
Anthracene	120-12-7	UG/L	n	180	-	180														
Atrazine	1912-24-9	UG/L	c	0.3	3	0.3														
Benzaldehyde	100-52-7	UG/L	n	190	-	190														
Benzo(a)anthracene	56-55-3	UG/L	c	0.012	-	0.012														
Benzo(a)pyrene	50-32-8	UG/L	c	0.0034	0.2	0.0034														
Benzo(b)fluoranthene	205-99-2	UG/L	c	0.034	-	0.034														
Benzo(g,h,i)perylene	191-24-2	UG/L	-	-	-	-														
Benzo(k)fluoranthene	207-08-9	UG/L	c	0.34	-	0.34														
Bis(2-chloroethoxy)methane	111-91-1	UG/L	n	5.9	-	5.9														
Bis(2-chloroethyl)ether	111-44-4	UG/L	c	0.014	-	0.014														
Bis(2-ethylhexyl)phthalate	117-81-7	UG/L	c	5.6	6	5.6														
Butylbenzylphthalate	85-68-7	UG/L	c	16	-	16														
Caprolactam	105-60-2	UG/L	n	990	-	990														
Carbazole	86-74-8	UG/L	-	-	-	-			2.5	J										
Chrysene	218-01-9	UG/L	c	3.4	-	3.4														
Dibenzo(a,h)anthracene	53-70-3	UG/L	c	0.0034	-	0.0034														

Table 4-10a

Semivolatile Organic Compounds (SVOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW42		MW43		MW44		MW45		MW46		MW47		MW47-DUP	
							03/20/14		03/12/14		03/20/14		03/21/14		03/12/14		03/21/14		03/21/14	
							Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Dibenzofuran	132-64-9	UG/L	n	0.79	-	0.79														
Diethylphthalate	84-66-2	UG/L	n	1500	-	1500									2	J				
Dimethylphthalate	131-11-3	UG/L	-	-	-	-														
Di-n-butylphthalate	84-74-2	UG/L	n	90	-	90														
Di-n-octylphthalate	117-84-0	UG/L	n	20	-	20														
Fluoranthene	206-44-0	UG/L	n	80	-	80														
Fluorene	86-73-7	UG/L	n	29	-	29														
Hexachlorobenzene	118-74-1	UG/L	c	0.0098	1	0.0098														
Hexachlorobutadiene	87-68-3	UG/L	c	0.14	-	0.14														
Hexachlorocyclopentadiene	77-47-4	UG/L	n	0.041	50	0.041														
Hexachloroethane	67-72-1	UG/L	c	0.33	-	0.33														
Indeno(1,2,3-cd)pyrene	193-39-5	UG/L	c	0.034	-	0.034														
Isophorone	78-59-1	UG/L	c	78	-	78														
Naphthalene	91-20-3	UG/L	c	0.17	-	0.17														
Nitrobenzene	98-95-3	UG/L	c	0.14	-	0.14														
N-Nitroso-di-n-propylamine	621-64-7	UG/L	c	0.011	-	0.011														
N-Nitrosodiphenylamine	86-30-6	UG/L	c	12	-	12														
Pentachlorophenol	87-86-5	UG/L	c	0.041	1	0.041														
Phenanthrene	85-01-8	UG/L	-	-	-	-														
Phenol	108-95-2	UG/L	n	580	-	580														
Pyrene	129-00-0	UG/L	n	12	-	12														

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW-08 12/23/2014 Result	MW-13S 12/22/2014 Result	MW-14S 12/17/2014 Result	MW-15S 12/15/2014 Result	MW-16S 12/15/2014 Result	MW-17S 12/23/2014 Result	MW-17S-DUP 12/23/2014 Result	MW-18S 12/22/2014 Result	MW-24 12/15/2014 Result	MW-25 12/15/2014 Result	MW-26D 12/17/2014 Result
1,1'-Biphenyl	92-52-4	UG/L	n	0.083	-	0.083	0 - 0	0											
1,2,4,5-Tetrachlorobenzene	95-94-3	UG/L	n	0.17	-	0.17	0 - 0	0											
2,2'-Oxybis(1-chloropropane)	108-60-1	UG/L	n	71	-	71	0 - 0	0											
2,3,4,6-Tetrachlorophenol	58-90-2	UG/L	n	24	-	24	0 - 0	0											
2,4,5-Trichlorophenol	95-95-4	UG/L	n	120	-	120	0 - 0	0											
2,4,6-Trichlorophenol	88-06-2	UG/L	n	1.2	-	1.2	0 - 0	0											
2,4-Dichlorophenol	120-83-2	UG/L	n	4.6	-	4.6	0 - 0	0											
2,4-Dimethylphenol	105-67-9	UG/L	n	36	-	36	0 - 0	0											
2,4-Dinitrophenol	51-28-5	UG/L	n	3.9	-	3.9	0 - 0	0											
2,4-Dinitrotoluene	121-14-2	UG/L	c	0.24	-	0.24	0 - 0	0											
2,6-Dinitrotoluene	606-20-2	UG/L	c	0.049	-	0.049	0 - 0	0											
2-Chloronaphthalene	91-58-7	UG/L	n	75	-	75	0 - 0	0											
2-Chlorophenol	95-57-8	UG/L	n	9.1	-	9.1	0 - 0	0											
2-Methylnaphthalene	91-57-6	UG/L	n	3.6	-	3.6	3.3 - 3.3	0										3.3 J	
2-Methylphenol	95-48-7	UG/L	n	93	-	93	0 - 0	0											
2-Nitroaniline	88-74-4	UG/L	n	19	-	19	0 - 0	0											
2-Nitrophenol	88-75-5	UG/L	-	-	-	-	0 - 0	0											
3,3'-Dichlorobenzidine	91-94-1	UG/L	c	0.13	-	0.13	0 - 0	0											
3-Nitroaniline	99-09-2	UG/L	-	-	-	-	0 - 0	0											
4,6-Dinitro-2-methylphenol	534-52-1	UG/L	n	0.15	-	0.15	0 - 0	0											
4-Bromophenyl-phenylether	101-55-3	UG/L	-	-	-	-	0 - 0	0											
4-Chloro-3-methylphenol	59-50-7	UG/L	n	140	-	140	0 - 0	0											
4-Chloroaniline	106-47-8	UG/L	c	0.37	-	0.37	0 - 0	0											
4-Chlorophenyl-phenylether	7005-72-3	UG/L	-	-	-	-	0 - 0	0											
4-Methylphenol	106-44-5	UG/L	n	190	-	190	0 - 0	0											
4-Nitroaniline	100-01-6	UG/L	c	3.8	-	3.8	0 - 0	0											
4-Nitrophenol	100-02-7	UG/L	-	-	-	-	0 - 0	0											
Acenaphthene	83-32-9	UG/L	n	53	-	53	0 - 0	0											
Acenaphthylene	208-96-8	UG/L	-	-	-	-	0 - 0	0											
Acetophenone	98-86-2	UG/L	n	190	-	190	0 - 0	0											
Anthracene	120-12-7	UG/L	n	180	-	180	0.91 - 0.91	0											
Atrazine	1912-24-9	UG/L	c	0.3	3		0 - 0	0											
Benzaldehyde	100-52-7	UG/L	n	190	-	190	0 - 0	0											
Benzo(a)anthracene	56-55-3	UG/L	c	0.012	-		0 - 0	0											
Benzo(a)pyrene	50-32-8	UG/L	c	0.0034	0.2		0 - 0	0											
Benzo(b)fluoranthene	205-99-2	UG/L	c	0.034	-		0 - 0	0											
Benzo(g,h,i)perylene	191-24-2	UG/L	-	-	-	-	0 - 0	0											
Benzo(k)fluoranthene	207-08-9	UG/L	c	0.34	-		0 - 0	0											
Bis(2-chloroethoxy)methane	111-91-1	UG/L	n	5.9	-		0 - 0	0											
Bis(2-chloroethyl)ether	111-44-4	UG/L	c	0.014	-	0.014	1.2 - 1.2	1			1.2 J								
Bis(2-ethylhexyl)phthalate	117-81-7	UG/L	c	5.6	6	5.6	0.32 - 0.32	0									0.32 J		
Butylbenzylphthalate	85-68-7	UG/L	c	16	-		0 - 0	0											
Caprolactam	105-60-2	UG/L	n	990	-		0 - 0	0											
Carbazole	86-74-8	UG/L	-	-	-		0 - 0	0											
Chrysene	218-01-9	UG/L	c	3.4	-		0 - 0	0											
Dibenzo(a,h)anthracene	53-70-3	UG/L	c	0.0034	-	0.0034	0 - 0	0											
Dibenzofuran	132-64-9	UG/L	n	0.79	-	0.79	0 - 0	0											
Diethylphthalate	84-66-2	UG/L	n	1500	-		0 - 0	0											
Dimethylphthalate	131-11-3	UG/L	-	-	-		0 - 0	0											
Di-n-butylphthalate	84-74-2	UG/L	n	90	-		0 - 0	0											
Di-n-octylphthalate	117-84-0	UG/L	n	20	-		0 - 0	0											
Fluoranthene	206-44-0	UG/L	n	80	-	80	0 - 0	0											
Fluorene	86-73-7	UG/L	n	29	-	29	0 - 0	0											
Hexachlorobenzene	118-74-1	UG/L	c	0.0098	1		0 - 0	0											
Hexachlorobutadiene	87-68-3	UG/L	c	0.14	-		0 - 0	0											
Hexachlorocyclopentadiene	77-47-4	UG/L	n	0.041	50		0 - 0	0											
Hexachloroethane	67-72-1	UG/L	c	0.33	-		0 - 0	0											
Indeno(1,2,3-cd)pyrene	193-39-5	UG/L	c	0.034	-	0.034	0 - 0	0											
Isophorone	78-59-1	UG/L	c	78	-	0.17	0 - 0	0											
Naphthalene	91-20-3	UG/L	c	0.17	-	0.17	5.2 - 5.2	0										5.2	
Nitrobenzene	98-95-3	UG/L	c	0.14	-		0 - 0	0											
N-Nitroso-di-n-propylamine	621-64-7	UG/L	c	0.011	-		0 - 0	0											
N-Nitrosodiphenylamine	86-30-6	UG/L	c	12	-	12	0 - 0	0											
Pentachlorophenol	87-86-5	UG/L	c	0.041	1		0 - 0	0											
Phenanthrene	85-01-8	UG/L	-	-	-	-	0 - 0	0											
Phenol	108-95-2	UG/L	n	580	-	580	0 - 0	0											
Pyrene	129-00-0	UG/L	n	12	-	12	0 - 0	0											

Data Qualifiers:

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

Table 4-10b

Semivolatile Organic Compounds (SVOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW-26S 12/17/2014	MW-27 12/15/2014	MW-28 12/22/2014	MW-29 12/15/2014	MW-30 12/15/2014	MW-31 12/16/2014	MW-32 12/15/2014	MW-33 12/8/2014	MW-35 12/8/2014	MW-38 12/4/2014	MW-39 12/22/2014	MW-40 12/8/2014	MW-41D 12/8/2014
							Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,1'-Biphenyl	92-52-4	UG/L	n	0.083	-	0.083													
1,2,4,5-Tetrachlorobenzene	95-94-3	UG/L	n	0.17	-	0.17													
2,2'-Oxybis(1-chloropropane)	108-60-1	UG/L	n	71	-	71													
2,3,4,6-Tetrachlorophenol	58-90-2	UG/L	n	24	-	24													
2,4,5-Trichlorophenol	95-95-4	UG/L	n	120	-	120													
2,4,6-Trichlorophenol	88-06-2	UG/L	n	1.2	-	1.2													
2,4-Dichlorophenol	120-83-2	UG/L	n	4.6	-	4.6													
2,4-Dimethylphenol	105-67-9	UG/L	n	36	-	36													
2,4-Dinitrophenol	51-28-5	UG/L	n	3.9	-	3.9													
2,4-Dinitrotoluene	121-14-2	UG/L	c	0.24	-	0.24													
2,6-Dinitrotoluene	606-20-2	UG/L	c	0.049	-	0.049													
2-Chloronaphthalene	91-58-7	UG/L	n	75	-	75													
2-Chlorophenol	95-57-8	UG/L	n	9.1	-	9.1													
2-Methylnaphthalene	91-57-6	UG/L	n	3.6	-	3.6													
2-Methylphenol	95-48-7	UG/L	n	93	-	93													
2-Nitroaniline	88-74-4	UG/L	n	19	-	19													
2-Nitrophenol	88-75-5	UG/L	-	-	-	-													
3,3'-Dichlorobenzidine	91-94-1	UG/L	c	0.13	-	0.13													
3-Nitroaniline	99-09-2	UG/L	-	-	-	-													
4,6-Dinitro-2-methylphenol	534-52-1	UG/L	n	0.15	-	0.15													
4-Bromophenyl-phenylether	101-55-3	UG/L	-	-	-	-													
4-Chloro-3-methylphenol	59-50-7	UG/L	n	140	-	140													
4-Chloroaniline	106-47-8	UG/L	c	0.37	-	0.37													
4-Chlorophenyl-phenylether	7005-72-3	UG/L	-	-	-	-													
4-Methylphenol	106-44-5	UG/L	n	190	-	190													
4-Nitroaniline	100-01-6	UG/L	c	3.8	-	3.8													
4-Nitrophenol	100-02-7	UG/L	-	-	-	-													
Acenaphthene	83-32-9	UG/L	n	53	-	53													
Acenaphthylene	208-96-8	UG/L	-	-	-	-													
Acetophenone	98-86-2	UG/L	n	190	-	190													
Anthracene	120-12-7	UG/L	n	180	-	180													0.91 J
Atrazine	1912-24-9	UG/L	c	0.3	3														
Benzaldehyde	100-52-7	UG/L	n	190	-	190													
Benzo(a)anthracene	56-55-3	UG/L	c	0.012	-														
Benzo(a)pyrene	50-32-8	UG/L	c	0.0034	0.2														
Benzo(b)fluoranthene	205-99-2	UG/L	c	0.034	-														
Benzo(g,h,i)perylene	191-24-2	UG/L	-	-	-	-													
Benzo(k)fluoranthene	207-08-9	UG/L	c	0.34	-														
Bis(2-chloroethoxy)methane	111-91-1	UG/L	n	5.9	-														
Bis(2-chloroethyl)ether	111-44-4	UG/L	c	0.014	-	0.014													
Bis(2-ethylhexyl)phthalate	117-81-7	UG/L	c	5.6	6	5.6													
Butylbenzylphthalate	85-68-7	UG/L	c	16	-														
Caprolactam	105-60-2	UG/L	n	990	-														
Carbazole	86-74-8	UG/L	-	-	-														
Chrysene	218-01-9	UG/L	c	3.4	-														
Dibenzo(a,h)anthracene	53-70-3	UG/L	c	0.0034	-	0.0034													
Dibenzofuran	132-64-9	UG/L	n	0.79	-	0.79													
Diethylphthalate	84-66-2	UG/L	n	1500	-														
Dimethylphthalate	131-11-3	UG/L	-	-	-														
Di-n-butylphthalate	84-74-2	UG/L	n	90	-														
Di-n-octylphthalate	117-84-0	UG/L	n	20	-														
Fluoranthene	206-44-0	UG/L	n	80	-	80													
Fluorene	86-73-7	UG/L	n	29	-	29													
Hexachlorobenzene	118-74-1	UG/L	c	0.0098	1														
Hexachlorobutadiene	87-68-3	UG/L	c	0.14	-														
Hexachlorocyclopentadiene	77-47-4	UG/L	n	0.041	50														
Hexachloroethane	67-72-1	UG/L	c	0.33	-														
Indeno(1,2,3-cd)pyrene	193-39-5	UG/L	c	0.034	-	0.034													
Isophorone	78-59-1	UG/L	c	78	-	0.17													
Naphthalene	91-20-3	UG/L	c	0.17	-	0.17													
Nitrobenzene	98-95-3	UG/L	c	0.14	-														
N-Nitroso-di-n-propylamine	621-64-7	UG/L	c	0.011	-														
N-Nitrosodiphenylamine	86-30-6	UG/L	c	12	-	12													
Pentachlorophenol	87-86-5	UG/L	c	0.041	1														
Phenanthrene	85-01-8	UG/L	-	-	-	-													
Phenol	108-95-2	UG/L	n	580	-	580													
Pyrene	129-00-0	UG/L	n	12	-	12													

Data Qualifiers:

J -- Value is considered estimated due to exceedance of technical quality control criteria or t

Table 4-10b
Semivolatile Organic Compounds (SVOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW-41D-DUP 12/8/2014		MW-41S 12/10/2014		MW-42 12/23/2014		MW-43 12/11/2014		MW-44 12/8/2014		MW-46 12/11/2014		MW-47 12/19/2014		MW-47-DUP 12/19/2014	
							Result		Result		Result		Result		Result		Result		Result		Result	
1,1'-Biphenyl	92-52-4	UG/L	n	0.083	-	0.083																
1,2,4,5-Tetrachlorobenzene	95-94-3	UG/L	n	0.17	-	0.17																
2,2'-Oxybis(1-chloropropane)	108-60-1	UG/L	n	71	-	71																
2,3,4,6-Tetrachlorophenol	58-90-2	UG/L	n	24	-	24																
2,4,5-Trichlorophenol	95-95-4	UG/L	n	120	-	120																
2,4,6-Trichlorophenol	88-06-2	UG/L	n	1.2	-	1.2																
2,4-Dichlorophenol	120-83-2	UG/L	n	4.6	-	4.6																
2,4-Dimethylphenol	105-67-9	UG/L	n	36	-	36																
2,4-Dinitrophenol	51-28-5	UG/L	n	3.9	-	3.9																
2,4-Dinitrotoluene	121-14-2	UG/L	c	0.24	-	0.24																
2,6-Dinitrotoluene	606-20-2	UG/L	c	0.049	-	0.049																
2-Chloronaphthalene	91-58-7	UG/L	n	75	-	75																
2-Chlorophenol	95-57-8	UG/L	n	9.1	-	9.1																
2-Methylnaphthalene	91-57-6	UG/L	n	3.6	-	3.6																
2-Methylphenol	95-48-7	UG/L	n	93	-	93																
2-Nitroaniline	88-74-4	UG/L	n	19	-	19																
2-Nitrophenol	88-75-5	UG/L	-	-	-	-																
3,3'-Dichlorobenzidine	91-94-1	UG/L	c	0.13	-	0.13																
3-Nitroaniline	99-09-2	UG/L	-	-	-	-																
4,6-Dinitro-2-methylphenol	534-52-1	UG/L	n	0.15	-	0.15																
4-Bromophenyl-phenylether	101-55-3	UG/L	-	-	-	-																
4-Chloro-3-methylphenol	59-50-7	UG/L	n	140	-	140																
4-Chloroaniline	106-47-8	UG/L	c	0.37	-	0.37																
4-Chlorophenyl-phenylether	7005-72-3	UG/L	-	-	-	-																
4-Methylphenol	106-44-5	UG/L	n	190	-	190																
4-Nitroaniline	100-01-6	UG/L	c	3.8	-	3.8																
4-Nitrophenol	100-02-7	UG/L	-	-	-	-																
Acenaphthene	83-32-9	UG/L	n	53	-	53																
Acenaphthylene	208-96-8	UG/L	-	-	-	-																
Acetophenone	98-86-2	UG/L	n	190	-	190																
Anthracene	120-12-7	UG/L	n	180	-	180																
Atrazine	1912-24-9	UG/L	c	0.3	3																	
Benzaldehyde	100-52-7	UG/L	n	190	-	190																
Benzo(a)anthracene	56-55-3	UG/L	c	0.012	-																	
Benzo(a)pyrene	50-32-8	UG/L	c	0.0034	0.2																	
Benzo(b)fluoranthene	205-99-2	UG/L	c	0.034	-																	
Benzo(g,h,i)perylene	191-24-2	UG/L	-	-	-	-																
Benzo(k)fluoranthene	207-08-9	UG/L	c	0.34	-																	
Bis(2-chloroethoxy)methane	111-91-1	UG/L	n	5.9	-																	
Bis(2-chloroethyl)ether	111-44-4	UG/L	c	0.014	-	0.014																
Bis(2-ethylhexyl)phthalate	117-81-7	UG/L	c	5.6	6	5.6																
Butylbenzylphthalate	85-68-7	UG/L	c	16	-																	
Caprolactam	105-60-2	UG/L	n	990	-																	
Carbazole	86-74-8	UG/L	-	-	-																	
Chrysene	218-01-9	UG/L	c	3.4	-																	
Dibenzo(a,h)anthracene	53-70-3	UG/L	c	0.0034	-	0.0034																
Dibenzofuran	132-64-9	UG/L	n	0.79	-	0.79																
Diethylphthalate	84-66-2	UG/L	n	1500	-																	
Dimethylphthalate	131-11-3	UG/L	-	-	-																	
Di-n-butylphthalate	84-74-2	UG/L	n	90	-																	
Di-n-octylphthalate	117-84-0	UG/L	n	20	-																	
Fluoranthene	206-44-0	UG/L	n	80	-	80																
Fluorene	86-73-7	UG/L	n	29	-	29																
Hexachlorobenzene	118-74-1	UG/L	c	0.0098	1																	
Hexachlorobutadiene	87-68-3	UG/L	c	0.14	-																	
Hexachlorocyclopentadiene	77-47-4	UG/L	n	0.041	50																	
Hexachloroethane	67-72-1	UG/L	c	0.33	-																	
Indeno(1,2,3-cd)pyrene	193-39-5	UG/L	c	0.034	-	0.034																
Isophorone	78-59-1	UG/L	c	78	-	0.17																
Naphthalene	91-20-3	UG/L	c	0.17	-	0.17																
Nitrobenzene	98-95-3	UG/L	c	0.14	-																	
N-Nitroso-di-n-propylamine	621-64-7	UG/L	c	0.011	-																	
N-Nitrosodiphenylamine	86-30-6	UG/L	c	12	-	12																
Pentachlorophenol	87-86-5	UG/L	c	0.041	1																	
Phenanthrene	85-01-8	UG/L	-	-	-	-																
Phenol	108-95-2	UG/L	n	580	-	580																
Pyrene	129-00-0	UG/L	n	12	-	12																

Data Qualifiers:

J -- Value is considered estimated due to exceedance of technical quality control criteria or t

Table 4-10c

Semivolatile Organic Compounds (SVOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW08		MW13S		MW14S		MW15S		MW16S		MW17S		MW18S		MW24		MW25		MW26D		MW26S		MW27		MW28		MW29	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
1,1'-Biphenyl	92-52-4	n	0.083	-	0.083	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
1,2,4,5-Tetrachlorobenzene	95-94-3	n	0.17	-	0.17	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
1,4-Dioxane	123-91-1	c	0.46	-	0.46	UG/L	0.34	-	290	22	0.95		4.5		5.7		1.1		41				1.2		10				0.86				0.34	J	32	J-		
2,2'-oxybis(1-chloropropane)	108-60-1	n	71	-	71	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
2,3,4,6-Tetrachlorophenol	58-90-2	n	24	-	24	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
2,4,5-Trichlorophenol	95-95-4	n	120	-	120	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
2,4,6-Trichlorophenol	88-06-2	n	1.2	-	1.2	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
2,4-Dichlorophenol	120-83-2	n	4.6	-	4.6	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
2,4-Dimethylphenol	105-67-9	n	36	-	36	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
2,4-Dinitrophenol	51-28-5	n	3.9	-	3.9	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
2,4-Dinitrotoluene	121-14-2	c	0.24	-	0.24	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
2,6-Dinitrotoluene	606-20-2	c	0.049	-	0.049	UG/L	8.6	-	8.6	1	NA		8.6		NA		NA				NA		NA		NA								NA				NA	
2-Chloronaphthalene	91-58-7	n	75	-	75	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
2-Chlorophenol	95-57-8	n	9.1	-	9.1	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
2-Methylnaphthalene	91-57-6	n	3.6	-	3.6	UG/L	9.3	-	9.3	1	NA				NA		NA				NA		NA		NA		9.3						NA		NA		NA	
2-Methylphenol	95-48-7	n	93	-	93	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
2-Nitroaniline	88-74-4	n	19	-	19	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
2-Nitrophenol	88-75-5	-	-	-	-	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
3,3'-Dichlorobenzidine	91-94-1	c	0.13	-	0.13	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
3-Nitroaniline	99-09-2	-	-	-	-	UG/L	4.9	-	4.9	1	NA		4.9	J	NA		NA				NA		NA		NA								NA				NA	
4,6-Dinitro-2-methylphenol	534-52-1	n	0.15	-	0.15	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
4-Bromophenyl-phenylether	101-55-3	-	-	-	-	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
4-Chloro-3-methylphenol	59-50-7	n	140	-	140	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
4-Chloroaniline	106-47-8	c	0.37	-	0.37	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
4-Chlorophenyl-phenylether	7005-72-3	-	-	-	-	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
4-Methylphenol	106-44-5	n	190	-	190	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
4-Nitroaniline	100-01-6	c	3.8	-	3.8	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
4-Nitrophenol	100-02-7	-	-	-	-	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Acenaphthene	83-32-9	n	53	-	53	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Acenaphthylene	208-96-8	-	-	-	-	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Acetophenone	98-86-2	n	190	-	190	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Anthracene	120-12-7	n	180	-	180	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Atrazine	1912-24-9	c	0.3	3	0.3	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Semivolatile Organic Compounds (SVOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW08		MW13S		MW14S		MW15S		MW16S		MW17S		MW18S		MW24		MW25		MW26D		MW26S		MW27		MW28		MW29	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Benzaldehyde	100-52-7	n	190	-	190	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Benzo(a)anthracene	56-55-3	c	0.012	-	0.012	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA		NA		NA	
Benzo(a)pyrene	50-32-8	c	0.0034	0.2	0.0034	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Benzo(b)fluoranthene	205-99-2	c	0.034	-	0.034	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Benzo(k)fluoranthene	207-08-9	c	0.34	-	0.34	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Bis(2-Chloroethoxy)methane	111-91-1	n	5.9	-	5.9	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Bis(2-Chloroethyl)ether	111-44-4	c	0.014	-	0.014	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
bis(2-ethylhexyl)phthalate	117-81-7	c	5.6	6	5.6	UG/L	0.59	-	1.3	4	NA		0.59	J	NA		NA		1.3	J	NA		NA		NA						0.9	J	NA				NA	
Butylbenzylphthalate	85-68-7	c	16	-	16	UG/L	0.47	-	0.6	2	NA		0.47	J	NA		NA				NA		NA		NA						0.6	J	NA				NA	
Caprolactam	105-60-2	n	990	-	990	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Carbazole	86-74-8	-	-	-	-	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Chrysene	218-01-9	c	3.4	-	3.4	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Dibenzo(a,h)anthracene	53-70-3	c	0.0034	-	0.0034	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Dibenzofuran	132-64-9	n	0.79	-	0.79	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Diethylphthalate	84-66-2	n	1500	-	1500	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Dimethylphthalate	131-11-3	-	-	-	-	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Di-n-butylphthalate	84-74-2	n	90	-	90	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Di-n-octylphthalate	117-84-0	n	20	-	20	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Fluoranthene	206-44-0	n	80	-	80	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Fluorene	86-73-7	n	29	-	29	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Hexachlorobenzene	118-74-1	c	0.0098	1	0.0098	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Hexachlorobutadiene	87-68-3	c	0.14	-	0.14	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Hexachlorocyclopentadiene	77-47-4	n	0.041	50	0.041	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Hexachloroethane	67-72-1	c	0.33	-	0.33	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Indeno(1,2,3-cd)pyrene	193-39-5	c	0.034	-	0.034	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Isophorone	78-59-1	c	78	-	78	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Naphthalene	91-20-3	c	0.17	-	0.17	UG/L	8	-	8	1	NA				NA		NA				NA		NA		NA		8						NA		NA		NA	
Nitrobenzene	98-95-3	c	0.14	-	0.14	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
N-Nitroso-di-n-propylamine	621-64-7	c	0.011	-	0.011	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
N-Nitrosodiphenylamine	86-30-6	c	12	-	12	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Pentachlorophenol	87-86-5	c	0.041	1	0.041	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Phenanthrene	85-01-8	-	-	-	-	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	
Phenol	108-95-2	n	580	-	580	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA								NA				NA	
Pyrene	129-00-0	n	12	-	12	UG/L	0	-	0	0	NA				NA		NA				NA		NA		NA		NA						NA		NA		NA	

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-10c

Semivolatile Organic Compounds (SVOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	MW30	MW31	MW32	MW33	MW35	MW38	MW39	MW40	MW41D	MW41S	MW42	MW43	MW44	MW46	MW47
							Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,1'-Biphenyl	92-52-4	n	0.083	-	0.083	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	95-94-3	n	0.17	-	0.17	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
1,4-Dioxane	123-91-1	c	0.46	-	0.46	UG/L	0.54		21	1.5		30	1.4		290	0.71	3.1	9.6	0.82	7.6	18
2,2'-oxybis(1-chloropropane)	108-60-1	n	71	-	71	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	58-90-2	n	24	-	24	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	95-95-4	n	120	-	120	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	n	1.2	-	1.2	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2,4-Dichlorophenol	120-83-2	n	4.6	-	4.6	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2,4-Dimethylphenol	105-67-9	n	36	-	36	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2,4-Dinitrophenol	51-28-5	n	3.9	-	3.9	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2,4-Dinitrotoluene	121-14-2	c	0.24	-	0.24	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2,6-Dinitrotoluene	606-20-2	c	0.049	-	0.049	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2-Chloronaphthalene	91-58-7	n	75	-	75	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2-Chlorophenol	95-57-8	n	9.1	-	9.1	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2-Methylnaphthalene	91-57-6	n	3.6	-	3.6	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
2-Methylphenol	95-48-7	n	93	-	93	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2-Nitroaniline	88-74-4	n	19	-	19	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
2-Nitrophenol	88-75-5	-	-	-	-	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	91-94-1	c	0.13	-	0.13	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
3-Nitroaniline	99-09-2	-	-	-	-	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	534-52-1	n	0.15	-	0.15	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	101-55-3	-	-	-	-	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	59-50-7	n	140	-	140	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
4-Chloroaniline	106-47-8	c	0.37	-	0.37	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	7005-72-3	-	-	-	-	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
4-Methylphenol	106-44-5	n	190	-	190	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
4-Nitroaniline	100-01-6	c	3.8	-	3.8	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
4-Nitrophenol	100-02-7	-	-	-	-	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Acenaphthene	83-32-9	n	53	-	53	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Acenaphthylene	208-96-8	-	-	-	-	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Acetophenone	98-86-2	n	190	-	190	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Anthracene	120-12-7	n	180	-	180	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Atrazine	1912-24-9	c	0.3	3	0.3	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Semivolatile Organic Compounds (SVOCs) Detected in Shallow Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	MW30	MW31	MW32	MW33	MW35	MW38	MW39	MW40	MW41D	MW41S	MW42	MW43	MW44	MW46	MW47
							Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzaldehyde	100-52-7	n	190	-	190	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Benzo(a)anthracene	56-55-3	c	0.012	-	0.012	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8	c	0.0034	0.2	0.0034	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2	c	0.034	-	0.034	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Benzo(k)fluoranthene	207-08-9	c	0.34	-	0.34	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Bis(2-Chloroethoxy)methane	111-91-1	n	5.9	-	5.9	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Bis(2-Chloroethyl)ether	111-44-4	c	0.014	-	0.014	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
bis(2-ethylhexyl)phthalate	117-81-7	c	5.6	6	5.6	UG/L	NA	NA	NA	NA			NA			0.6 J	NA	NA	NA	NA	NA
Butylbenzylphthalate	85-68-7	c	16	-	16	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Caprolactam	105-60-2	n	990	-	990	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Carbazole	86-74-8	-	-	-	-	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Chrysene	218-01-9	c	3.4	-	3.4	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	53-70-3	c	0.0034	-	0.0034	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Dibenzofuran	132-64-9	n	0.79	-	0.79	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Diethylphthalate	84-66-2	n	1500	-	1500	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Dimethylphthalate	131-11-3	-	-	-	-	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Di-n-butylphthalate	84-74-2	n	90	-	90	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Di-n-octylphthalate	117-84-0	n	20	-	20	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Fluoranthene	206-44-0	n	80	-	80	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Fluorene	86-73-7	n	29	-	29	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Hexachlorobenzene	118-74-1	c	0.0098	1	0.0098	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Hexachlorobutadiene	87-68-3	c	0.14	-	0.14	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	77-47-4	n	0.041	50	0.041	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Hexachloroethane	67-72-1	c	0.33	-	0.33	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5	c	0.034	-	0.034	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Isophorone	78-59-1	c	78	-	78	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Naphthalene	91-20-3	c	0.17	-	0.17	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Nitrobenzene	98-95-3	c	0.14	-	0.14	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	621-64-7	c	0.011	-	0.011	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	86-30-6	c	12	-	12	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	c	0.041	1	0.041	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Phenanthrene	85-01-8	-	-	-	-	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA
Phenol	108-95-2	n	580	-	580	UG/L	NA	NA	NA	NA			NA				NA	NA	NA	NA	NA
Pyrene	129-00-0	n	12	-	12	UG/L	NA	NA	NA	NA		NA	NA		NA		NA	NA	NA	NA	NA

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-10d

1,4 Dioxane and Polycyclic Aromatic Hydrocarbons (PAHs) Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW08	MW13S	MW14S	MW15S	MW16S	MW17S	MW17S-DUP	MW18S	MW24	MW25	MW26D	MW26S
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,4-Dioxane	123-91-1	ug/L	c	0.46	-	0.46	0.12 - 150	26		24	6.1	0.37 J	24				12	0.86	1	
2-Methylnaphthalene	91-57-6	ug/L	n	3.6	-	3.6	0.006 - 3.3	4		0.0064 J							NA	3.3		0.012 J
Acenaphthene	83-32-9	ug/L	n	53	-	53	0.019 - 0.17	4				0.05 J					NA	0.17		0.15
Acenaphthylene	208-96-8	ug/L	-	-	-	-	0.006 - 0.081	9		0.023 J	0.081 J		0.036 J				NA			
Anthracene	120-12-7	ug/L	n	180	-	180	0.029 - 0.63	8					0.11				NA			
Benzo(a)anthracene	56-55-3	ug/L	c	0.012	-	0.012	0.008 - 0.034	3					0.02 J				NA			
Benzo(a)pyrene	50-32-8	ug/L	c	0.0034	0.2	0.0034	0 - 0	0									NA			
Benzo(b)fluoranthene	205-99-2	ug/L	c	0.034	-	0.034	0.005 - 0.0077	3	0.0054 J						0.0077 J		NA			
Benzo(g,h,i)perylene	191-24-2	ug/L	-	-	-	-	0 - 0	0									NA			
Benzo(k)fluoranthene	207-08-9	ug/L	c	0.34	-	0.34	0.007 - 0.0072	1							0.0072 J		NA			
Chrysene	218-01-9	ug/L	c	3.4	-	3.4	0 - 0	0									NA			
Dibenzo(a,h)anthracene	53-70-3	ug/L	c	0.0034	-	0.0034	0 - 0	0									NA			
Fluoranthene	206-44-0	ug/L	n	80	-	80	0.005 - 0.035	6	0.0099 J			0.015 J					NA		0.016 J	0.018 J
Fluorene	86-73-7	ug/L	n	29	-	29	0.048 - 0.12	3									NA	0.082 J		0.12
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	c	0.034	-	0.034	0 - 0	0									NA			
Naphthalene	91-20-3	ug/L	c	0.17	-	0.17	0.008 - 5.2	15		0.013 J		0.016 J	0.0089 J	0.0075 J			NA	5.2		
Pentachlorophenol	87-86-5	ug/L	c	0.041	1	0.041	0.21 - 0.21	1	NA	NA	NA			NA	NA	NA	NA	0.21 J	NA	NA
Phenanthrene	85-01-8	ug/L	-	-	-	-	0.005 - 0.025	5	0.0065 J			0.0075 J					NA		0.017 J	0.025 J
Pyrene	129-00-0	ug/L	n	12	-	12	0.015 - 0.025	2	0.025 J	0.015 J							NA			

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW27	MW28	MW29	MW30	MW31	MW32	MW33	MW35	MW38	MW39	MW40	MW41D	MW41D-DUP	MW41S
							Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,4-Dioxane	123-91-1	ug/L	c	0.46	-	0.46	0.34 J	58	0.14 J	0.9		12	2.4	0.63	43	0.89	1	150	110	0.12 J
2-Methylnaphthalene	91-57-6	ug/L	n	3.6	-	3.6		0.029 J												
Acenaphthene	83-32-9	ug/L	n	53	-	53									0.019 J					
Acenaphthylene	208-96-8	ug/L	-	-	-	-		0.027 J				0.0089 J			0.049 J				0.035 J	
Anthracene	120-12-7	ug/L	n	180	-	180		0.25				0.065 J			0.21			0.63	0.53	
Benzo(a)anthracene	56-55-3	ug/L	c	0.012	-	0.012		0.034 J												
Benzo(a)pyrene	50-32-8	ug/L	c	0.0034	0.2	0.0034														
Benzo(b)fluoranthene	205-99-2	ug/L	c	0.034	-	0.034														
Benzo(g,h,i)perylene	191-24-2	ug/L	-	-	-	-														
Benzo(k)fluoranthene	207-08-9	ug/L	c	0.34	-	0.34														
Chrysene	218-01-9	ug/L	c	3.4	-	3.4														
Dibenzo(a,h)anthracene	53-70-3	ug/L	c	0.0034	-	0.0034														
Fluoranthene	206-44-0	ug/L	n	80	-	80												0.035 J		
Fluorene	86-73-7	ug/L	n	29	-	29		0.048 J												
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	c	0.034	-	0.034														
Naphthalene	91-20-3	ug/L	c	0.17	-	0.17		0.11	0.044 J			0.02 J				0.0098 J	0.032 J	0.039 J		
Pentachlorophenol	87-86-5	ug/L	c	0.041	1	0.041		NA			NA		NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	ug/L	-	-	-	-														
Pyrene	129-00-0	ug/L	n	12	-	12														

Data Qualifiers:
J- -- Indicates that result is biased low.
J -- Value is considered estimated due to exceedance of technical quality control cri
J+ -- Indicates that result is biased high.
Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abu
Estimated Maximum Possible Concentration (EMPC) and is considered estimat
NA -- No result is available/applicable for this parameter in this sample.

Table 4-10d

1,4 Dioxane and Polycyclic Aromatic Hydrocarbons (PAHs) Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW42		MW43		MW44		MW46		MW47		MW47-DUP	
							Result		Result		Result		Result		Result		Result	
1,4-Dioxane	123-91-1	ug/L	c	0.46	-	0.46	7.2		10		0.86		22		13		9.9	
2-Methylnaphthalene	91-57-6	ug/L	n	3.6	-	3.6												
Acenaphthene	83-32-9	ug/L	n	53	-	53												
Acenaphthylene	208-96-8	ug/L	-	-	-	-	0.0057	J					0.012	J				
Anthracene	120-12-7	ug/L	n	180	-	180			0.029	J			0.06	J				
Benzo(a)anthracene	56-55-3	ug/L	c	0.012	-	0.012											0.0078	J
Benzo(a)pyrene	50-32-8	ug/L	c	0.0034	0.2	0.0034												
Benzo(b)fluoranthene	205-99-2	ug/L	c	0.034	-	0.034	0.0055	J										
Benzo(g,h,i)perylene	191-24-2	ug/L	-	-	-	-												
Benzo(k)fluoranthene	207-08-9	ug/L	c	0.34	-	0.34												
Chrysene	218-01-9	ug/L	c	3.4	-	3.4												
Dibenzo(a,h)anthracene	53-70-3	ug/L	c	0.0034	-	0.0034												
Fluoranthene	206-44-0	ug/L	n	80	-	80					0.0052	J						
Fluorene	86-73-7	ug/L	n	29	-	29												
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	c	0.034	-	0.034												
Naphthalene	91-20-3	ug/L	c	0.17	-	0.17	0.0079	J	0.028	J			0.057	J	0.0089	J		
Pentachlorophenol	87-86-5	ug/L	c	0.041	1	0.041					NA				NA		NA	
Phenanthrene	85-01-8	ug/L	-	-	-	-											0.0052	J
Pyrene	129-00-0	ug/L	n	12	-	12												

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control cri

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abu

Estimated Maximum Possible Concentration (EMPC) and is considered estima

NA -- No result is available/applicable for this parameter in this sample.

Table 4-10e

PAHs Detected in Shallow Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW13S		MW16S		MW25		MW26D		MW26S		MW28		MW35		MW38		MW40		MW41D		MW41S	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
2-Methylnaphthalene	91-57-6	n	3.6	-	3.6	UG/L	0	-	0	0					NA																	
Acenaphthene	83-32-9	n	53	-	53	UG/L	0.22	-	0.27	2					0.27				0.22													
Acenaphthylene	208-96-8	-	-	-	-	UG/L	0	-	0	0																						
Anthracene	120-12-7	n	180	-	180	UG/L	0.054	-	1.6	7	0.083	J	0.4		0.19		0.054	J			0.22				0.63				1.6			
Benzo(a)anthracene	56-55-3	c	0.012	-	0.012	UG/L	0.26	-	0.26	1			0.26																			
Benzo(a)pyrene	50-32-8	c	0.0034	0.2	0.0034	UG/L	0.073	-	0.12	2			0.073	J	0.12																	
Benzo(b)fluoranthene	205-99-2	c	0.034	-	0.034	UG/L	0	-	0	0																						
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	UG/L	0.1	-	0.1	1					0.1																	
Benzo(k)fluoranthene	207-08-9	c	0.34	-	0.34	UG/L	0	-	0	0																						
Chrysene	218-01-9	c	3.4	-	3.4	UG/L	0.21	-	0.21	1			0.21																			
Dibenzo(a,h)anthracene	53-70-3	c	0.0034	-	0.0034	UG/L	0	-	0	0																						
Fluoranthene	206-44-0	n	80	-	80	UG/L	0.21	-	0.21	1					0.21																	
Fluorene	86-73-7	n	29	-	29	UG/L	0.083	-	0.47	3			0.083	J	0.47				0.2													
Indeno(1,2,3-cd)pyrene	193-39-5	c	0.034	-	0.034	UG/L	0	-	0	0																						
Naphthalene	91-20-3	c	0.17	-	0.17	UG/L	0.065	-	0.065	1					NA				0.065	J												
Pentachlorophenol	87-86-5	c	0.041	1	0.041	UG/L	0.094	-	0.24	3			0.17	J	0.24																0.094	J
Phenanthrene	85-01-8	-	-	-	-	UG/L	0.43	-	0.67	2			0.43		0.67																	
Pyrene	129-00-0	n	12	-	12	UG/L	0.065	-	0.47	5			0.13		0.47		0.065	J							0.11				0.13			

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-11a

Pesticides Detected in Shallow Groundwater -Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	QL	RSL	MCL	Screening Value	Range			Frequency	MW08		MW13S		MW14S		MW15S		MW16S		MW17S		MW17S-DUP		MW18S		MW24		MW25		MW26D	
												03/24/14		03/24/14		03/24/14		03/05/14		03/06/14		03/06/14		03/06/14		03/10/14		03/21/14		03/21/14		03/07/14	
												Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	UG/L	c	0.1	0.032	-	0.032	0	-	0	0																						
4,4'-DDE	72-55-9	UG/L	c	0.1	0.046	-	0.046	0	-	0	0																						
4,4'-DDT	50-29-3	UG/L	c	0.1	0.23	-	0.23	0	-	0	0																						
Aldrin	309-00-2	UG/L	c	0.05	0.00092	-	0.00092	0	-	0	0																						
alpha-BHC	319-84-6	UG/L	c	0.05	0.0072	-	0.0072	0	-	0	0																						
alpha-Chlordane	5103-71-9	UG/L	c	0.05	0.045	-	0.045	0	-	0	0																						
beta-BHC	319-85-7	UG/L	c	0.05	0.025	-	0.025	0.017	-	0.036	2									0.036	J												
delta-BHC	319-86-8	UG/L	-	0.05	-	-	-	0	-	0	0																						
Dieldrin	60-57-1	UG/L	c	0.1	0.0018	-	0.0018	0	-	0	0																						
Endosulfan I	959-98-8	UG/L	n	0.05	10	-	10	0	-	0	0																						
Endosulfan II	33213-65-9	UG/L	n	0.1	10	-	10	0	-	0	0																						
Endosulfan sulfate	1031-07-8	UG/L	n	0.1	10	-	10	0	-	0	0																						
Endrin	72-20-8	UG/L	n	0.1	0.23	2	0.23	0	-	0	0																						
Endrin aldehyde	7421-93-4	UG/L	n	0.1	0.23	-	0.23	0	-	0	0																						
Endrin ketone	53494-70-5	UG/L	n	0.1	0.23	-	0.23	0	-	0	0																						
gamma-BHC (Lindane)	58-89-9	UG/L	c	0.05	0.042	0.2	0.042	0	-	0	0																						
gamma-Chlordane	5103-74-2	UG/L	c	0.05	0.045	-	0.045	0	-	0	0																						
Heptachlor	76-44-8	UG/L	c	0.05	0.0014	0.4	0.0014	0	-	0	0																						
Heptachlor epoxide	1024-57-3	UG/L	c	0.05	0.0014	0.2	0.0014	0	-	0	0																						
Methoxychlor	72-43-5	UG/L	n	0.5	3.7	40	3.7	0	-	0	0																						
Toxaphene	8001-35-2	UG/L	c	5	0.071	3	0.071	0	-	0	0																						

Table 4-11a

Pesticides Detected in Shallow Groundwater -Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	QL	RSL	MCL	Screening Value	MW26S		MW27		MW28		MW29		MW30		MW31		MW32		MW33		MW35		MW38		MW39		MW40		MW41D	
								03/07/14		03/11/14		03/12/14		03/14/14		03/14/14		03/13/14		03/14/14		03/20/14		03/12/14		03/19/14		03/24/14		03/12/14		03/18/14	
								Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	UG/L	c	0.1	0.032	-	0.032																										
4,4'-DDE	72-55-9	UG/L	c	0.1	0.046	-	0.046																										
4,4'-DDT	50-29-3	UG/L	c	0.1	0.23	-	0.23																										
Aldrin	309-00-2	UG/L	c	0.05	0.00092	-	0.00092																										
alpha-BHC	319-84-6	UG/L	c	0.05	0.0072	-	0.0072																										
alpha-Chlordane	5103-71-9	UG/L	c	0.05	0.045	-	0.045																										
beta-BHC	319-85-7	UG/L	c	0.05	0.025	-	0.025			0.017	J																						
delta-BHC	319-86-8	UG/L	-	0.05	-	-	-																										
Dieldrin	60-57-1	UG/L	c	0.1	0.0018	-	0.0018																										
Endosulfan I	959-98-8	UG/L	n	0.05	10	-	10																										
Endosulfan II	33213-65-9	UG/L	n	0.1	10	-	10																										
Endosulfan sulfate	1031-07-8	UG/L	n	0.1	10	-	10																										
Endrin	72-20-8	UG/L	n	0.1	0.23	2	0.23																										
Endrin aldehyde	7421-93-4	UG/L	n	0.1	0.23	-	0.23																										
Endrin ketone	53494-70-5	UG/L	n	0.1	0.23	-	0.23																										
gamma-BHC (Lindane)	58-89-9	UG/L	c	0.05	0.042	0.2	0.042																										
gamma-Chlordane	5103-74-2	UG/L	c	0.05	0.045	-	0.045																										
Heptachlor	76-44-8	UG/L	c	0.05	0.0014	0.4	0.0014																										
Heptachlor epoxide	1024-57-3	UG/L	c	0.05	0.0014	0.2	0.0014																										
Methoxychlor	72-43-5	UG/L	n	0.5	3.7	40	3.7																										
Toxaphene	8001-35-2	UG/L	c	5	0.071	3	0.071																										

Table 4-11a

Pesticides Detected in Shallow Groundwater -Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	QL	RSL	MCL	Screening Value	MW41D-DUP		MW41S		MW42		MW43		MW44		MW45		MW46		MW47		MW47-DUP	
								03/18/14		03/18/14		03/20/14		03/12/14		03/20/14		03/21/14		03/12/14		03/21/14		03/21/14	
								Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	UG/L	c	0.1	0.032	-	0.032																		
4,4'-DDE	72-55-9	UG/L	c	0.1	0.046	-	0.046																		
4,4'-DDT	50-29-3	UG/L	c	0.1	0.23	-	0.23																		
Aldrin	309-00-2	UG/L	c	0.05	0.00092	-	0.00092																		
alpha-BHC	319-84-6	UG/L	c	0.05	0.0072	-	0.0072																		
alpha-Chlordane	5103-71-9	UG/L	c	0.05	0.045	-	0.045																		
beta-BHC	319-85-7	UG/L	c	0.05	0.025	-	0.025																		
delta-BHC	319-86-8	UG/L	-	0.05	-	-	-																		
Dieldrin	60-57-1	UG/L	c	0.1	0.0018	-	0.0018																		
Endosulfan I	959-98-8	UG/L	n	0.05	10	-	10																		
Endosulfan II	33213-65-9	UG/L	n	0.1	10	-	10																		
Endosulfan sulfate	1031-07-8	UG/L	n	0.1	10	-	10																		
Endrin	72-20-8	UG/L	n	0.1	0.23	2	0.23																		
Endrin aldehyde	7421-93-4	UG/L	n	0.1	0.23	-	0.23																		
Endrin ketone	53494-70-5	UG/L	n	0.1	0.23	-	0.23																		
gamma-BHC (Lindane)	58-89-9	UG/L	c	0.05	0.042	0.2	0.042																		
gamma-Chlordane	5103-74-2	UG/L	c	0.05	0.045	-	0.045																		
Heptachlor	76-44-8	UG/L	c	0.05	0.0014	0.4	0.0014																		
Heptachlor epoxide	1024-57-3	UG/L	c	0.05	0.0014	0.2	0.0014																		
Methoxychlor	72-43-5	UG/L	n	0.5	3.7	40	3.7																		
Toxaphene	8001-35-2	UG/L	c	5	0.071	3	0.071																		

Pesticides Detected in Shallow Groundwater -Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW08		MW13S		MW14S		MW15S		MW16S		MW17S		MW17S-DUP		MW18S		MW24		MW25	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
4,4'-DDD	72-54-8	ug/L	c	0.032	-	0.032	0.00017	-	0.0056	19	0.00027	J			0.00039	J	0.00017	J							0.00029	J	0.0019	J	0.0056	J
4,4'-DDE	72-55-9	ug/L	c	0.046	-	0.046	0.0001	-	0.0017	28	0.00013	J	0.00058	J	0.00067	J			0.00037	J	0.0003	J	0.00013	J	0.00034	J	0.0012	J	0.00094	J
4,4'-DDT	50-29-3	ug/L	c	0.23	-	0.23	0.00017	-	0.00057	3					0.00017	J														
Aldrin	309-00-2	ug/L	c	0.00092	-	0.00092	0.00015	-	0.0059	23			0.00023	J	0.0011	J			0.00093	J	0.00017	J	0.00019	J	0.00019	J	0.0012	J	0.0059	J
alpha-BHC	319-84-6	ug/L	c	0.0072	-	0.0072	0.0001	-	0.0026	20			0.00089	J	0.00094	J			0.00045	J							0.00057	J		
alpha-Chlordane	5103-71-9	ug/L	c	0.045	-	0.045	0.0001	-	0.0035	21	0.00029	J			0.00032	J	0.00031	J							0.0013	J	0.00056	J	0.0013	J
beta-BHC	319-85-7	ug/L	c	0.025	-	0.025	0.0002	-	0.0049	16									0.0049								0.0012	J	0.0031	J
delta-BHC	319-86-8	ug/L	-	-	-	-	0.00013	-	0.0069	22	0.00018	J	0.0018	J	0.00022	J	0.00013	J			0.00023	J			0.00033	J	0.0069			
Dieldrin	60-57-1	ug/L	c	0.0018	-	0.0018	0.00019	-	0.042	26			0.0022	J	0.00033	J	0.00038	J	0.0075						0.042		0.001	J	0.0054	J
Endosulfan I	959-98-8	ug/L	n	10	-	10	0.0001	-	0.0019	19					0.00093	J			0.00023	J	0.00037	J	0.00032	J	0.00062	J			0.0019	J
Endosulfan II	33213-65-9	ug/L	n	10	-	10	0.00021	-	0.0031	4					0.00024	J														
Endosulfan sulfate	1031-07-8	ug/L	n	10	-	10	0.00025	-	0.0013	14			0.00059	J	0.00034	J			0.00087	J							0.00039	J	0.00094	J
Endrin	72-20-8	ug/L	n	0.23	2	0.23	0.00019	-	0.0027	13			0.0011	J	0.00033	J	0.00019	J	0.00033	J									0.0027	J
Endrin aldehyde	7421-93-4	ug/L	n	0.23	-	0.23	0.00016	-	0.0041	11			0.00035	J	0.00016	J	0.00021	J							0.00062	J	0.00079	J	0.0041	J
Endrin ketone	53494-70-5	ug/L	n	0.23	-	0.23	0.00019	-	0.0053	20	0.00029	J	0.00027	J					0.00038	J	0.00027	J	0.00036	J	0.0053	J				
gamma-BHC (Lindane)	58-89-9	ug/L	c	0.042	0.2	0.042	0.0001	-	0.002	30	0.00015	J	0.00053	J	0.00047	J	0.00028	J	0.00049	J	0.00059	J	0.00067	J	0.00016	J	0.0002	J	0.002	J
gamma-Chlordane	5103-74-2	ug/L	c	0.045	-	0.045	0.00019	-	0.0031	26			0.00049	J	0.0003	J			0.00056	J	0.00022	J	0.00019	J	0.00085	J	0.00023	J		
Heptachlor	76-44-8	ug/L	c	0.0014	0.4	0.0014	0.0003	-	0.0028	16			0.00074	J	0.00056	J											0.00053	J	0.0028	J
Heptachlor epoxide	1024-57-3	ug/L	c	0.0014	0.2	0.0014	0.00022	-	0.0039	21			0.00022	J	0.00035	J			0.0011	J	0.00022	J	0.00033	J	0.00049	J			0.0039	J
Methoxychlor	72-43-5	ug/L	n	3.7	40	3.7	0.0003	-	0.0069	16			0.0013	J	0.00051	J											0.0045	J	0.0069	J
Toxaphene	8001-35-2	ug/L	c	0.071	3	0.071	0	-	0	0																				

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-11b

Pesticides Detected in Shallow Groundwater -Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW26D	MW26S	MW27	MW28	MW29	MW30	MW31	MW32	MW33	MW35	MW38	MW39	MW40
							Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
4,4'-DDD	72-54-8	ug/L	c	0.032	-	0.032	0.00048 J		0.0012 J	0.00095 J			0.00031 J	0.0005 J			0.0008 J		
4,4'-DDE	72-55-9	ug/L	c	0.046	-	0.046	0.0013 J		0.00051 J	0.00027 J	0.00031 J	0.00057 J	0.00031 J	0.0011 J	0.0001 J	0.0003 J	0.0017 J	0.00046 J	
4,4'-DDT	50-29-3	ug/L	c	0.23	-	0.23	0.00057 J												
Aldrin	309-00-2	ug/L	c	0.00092	-	0.00092	0.0019 J	0.00018 J	0.00025 J	0.0015 J		0.00028 J	0.00036 J	0.00015 J		0.0003 J	0.0014 J		
alpha-BHC	319-84-6	ug/L	c	0.0072	-	0.0072	0.00023 J		0.00088 J	0.00093 J			0.00045 J	0.00082 J		0.0004 J	0.0014 J		
alpha-Chlordane	5103-71-9	ug/L	c	0.045	-	0.045	0.00099 J			0.00045 J			0.0011 J		0.0035 J	0.0005 J	0.0006 J	0.00072 J	0.0001 J
beta-BHC	319-85-7	ug/L	c	0.025	-	0.025	0.0018 J		0.0013 J					0.0036 J	0.0006 J	0.0004 J	0.0017 J		0.0002 J
delta-BHC	319-86-8	ug/L	-	-	-	-	0.00058 J	0.00028 J		0.0028 J			0.00036 J		0.0002 J	0.0002 J	0.0009 J		0.0003 J
Dieldrin	60-57-1	ug/L	c	0.0018	-	0.0018	0.00035 J	0.00019 J	0.00068 J	0.0033		0.00086 J	0.00031 J	0.0011 J	0.0005 J	0.0002 J	0.0014 J	0.0027	
Endosulfan I	959-98-8	ug/L	n	10	-	10	0.00017 J					0.00011 J		0.00045 J	0.0002 J	0.0002 J	0.0001 J		
Endosulfan II	33213-65-9	ug/L	n	10	-	10	0.0031 J	0.0011 J											
Endosulfan sulfate	1031-07-8	ug/L	n	10	-	10	0.00098 J	0.00035 J	0.00068 J	0.001 J				0.00033 J			0.0004 J		
Endrin	72-20-8	ug/L	n	0.23	2	0.23				0.0016 J			0.00029 J	0.00035 J					
Endrin aldehyde	7421-93-4	ug/L	n	0.23	-	0.23	0.00091 J			0.0019 J			0.00048 J						
Endrin ketone	53494-70-5	ug/L	n	0.23	-	0.23			0.00048 J	0.0004 J	0.00021 J	0.00058 J		0.00065 J			0.0007 J	0.00019 J	
gamma-BHC (Lindane)	58-89-9	ug/L	c	0.042	0.2	0.042	0.00047 J		0.0005 J	0.0013 J	0.00019 J		0.00017 J	0.00075 J	0.0007 J	0.0002 J	0.0015 J	0.00019 J	0.0005 J
gamma-Chlordane	5103-74-2	ug/L	c	0.045	-	0.045	0.0003 J			0.00023 J	0.00087 J	0.00096 J	0.00028 J	0.00057 J	0.0025 J	0.0005 J	0.0031 J	0.00054 J	
Heptachlor	76-44-8	ug/L	c	0.0014	0.4	0.0014	0.0012 J		0.0017 J	0.0021 J			0.00067 J	0.00075 J	0.0003 J		0.0008 J		
Heptachlor epoxide	1024-57-3	ug/L	c	0.0014	0.2	0.0014	0.0012 J		0.00033 J	0.00062 J	0.00022 J	0.00036 J	0.00039 J	0.00047 J				0.0026	
Methoxychlor	72-43-5	ug/L	n	3.7	40	3.7	0.0023 J	0.0011 J	0.0021 J	0.002 J	0.00044 J	0.0015 J		0.001 J					
Toxaphene	8001-35-2	ug/L	c	0.071	3	0.071													

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality cont

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical io

Estimated Maximum Possible Concentration (EMPC) and is considered e

NA -- No result is available/applicable for this parameter in this sample.

Table 4-11b

Pesticides Detected in Shallow Groundwater -Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW41D		MW41D-DUP		MW41S		MW42		MW43		MW44		MW46		MW47		MW47-DUP	
							Result		Result		Result		Result		Result		Result		Result		Result		Result	
4,4'-DDD	72-54-8	ug/L	c	0.032	-	0.032	0.0005	J	0.001	J			0.00032	J	0.0007	J	0.0004	J	0.00075	J			0.00027	J
4,4'-DDE	72-55-9	ug/L	c	0.046	-	0.046	0.0017	J	0.0016	J	0.0013	J	0.00038	J	0.0011	J			0.00054	J	0.00034	J	0.00072	J
4,4'-DDT	50-29-3	ug/L	c	0.23	-	0.23																	0.00044	J
Aldrin	309-00-2	ug/L	c	0.00092	-	0.00092	0.0003	J	0.0004	J	0.00045	J	0.00022	J	0.00041	J			0.00059	J				
alpha-BHC	319-84-6	ug/L	c	0.0072	-	0.0072	0.0026	J	0.0021	J	0.001		0.00062	J	0.00094	J	0.0001	J	0.0014	J	0.00052	J	0.0008	J
alpha-Chlordane	5103-71-9	ug/L	c	0.045	-	0.045	0.0006	J	0.0011	J	0.00036	J	0.0015	J			0.0009	J			0.0012	J	0.0014	J
beta-BHC	319-85-7	ug/L	c	0.025	-	0.025	0.0047	J	0.0043	J	0.0011	J			0.0036	J	0.0005	J	0.0016	J				
delta-BHC	319-86-8	ug/L	-	-	-	-	0.0021	J	0.002	J	0.001	J	0.00028	J			0.0002	J			0.00016	J	0.00021	J
Dieldrin	60-57-1	ug/L	c	0.0018	-	0.0018	0.0004	J	0.001	J	0.00047	J	0.038				0.00029	J	0.00028	J	0.0046	J	0.0058	
Endosulfan I	959-98-8	ug/L	n	10	-	10	0.0007	J	0.0008	J					0.00093	J	0.00029	J	0.00063	J	0.00023	J	0.00026	J
Endosulfan II	33213-65-9	ug/L	n	10	-	10																	0.00021	J
Endosulfan sulfate	1031-07-8	ug/L	n	10	-	10	0.0013	J	0.0003	J					0.00025	J								
Endrin	72-20-8	ug/L	n	0.23	2	0.23					0.00027	J	0.00037	J					0.00026	J	0.00043	J	0.00049	J
Endrin aldehyde	7421-93-4	ug/L	n	0.23	-	0.23					0.0013	J									0.00024	J		
Endrin ketone	53494-70-5	ug/L	n	0.23	-	0.23	0.0033	J	0.002	J			0.0012	J	0.00054	J			0.00046	J	0.00063	J	0.00058	J
gamma-BHC (Lindane)	58-89-9	ug/L	c	0.042	0.2	0.042	0.0007	J	0.0006	J	0.00026	J	0.00052	J	0.00034	J	0.0001	J	0.002	J	0.00017	J	0.00018	J
gamma-Chlordane	5103-74-2	ug/L	c	0.045	-	0.045	0.0022	J	0.0023	J	0.00029	J	0.00063	J	0.00042	J	0.0006	J	0.0004	J	0.00068	J	0.00046	J
Heptachlor	76-44-8	ug/L	c	0.0014	0.4	0.0014	0.0016		0.0016	J					0.00087	J			0.00054	J			0.00058	J
Heptachlor epoxide	1024-57-3	ug/L	c	0.0014	0.2	0.0014			0.0025		0.00026	J			0.00067	J			0.00054	J	0.00047	J	0.00041	J
Methoxychlor	72-43-5	ug/L	n	3.7	40	3.7							0.0003	J	0.0013	J			0.0015	J	0.00053	J	0.0011	J
Toxaphene	8001-35-2	ug/L	c	0.071	3	0.071																		

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality cont

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical io

Estimated Maximum Possible Concentration (EMPC) and is considered e

NA -- No result is available/applicable for this parameter in this sample.

Table 4-11c
Pesticides Detected in Shallow Groundwater -Outside Landfill Boundary (July 2015)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	Units	RSL*	MCL**	Screening Value	Range	Frequency	MW08	MW13S	MW14S	MW15S	MW16S	MW17S	MW18S	MW24	MW25	MW28	MW38	MW39	MW41D	MW41S	MW42	MW47
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
4,4´-DDD	72-54-8	c	NG/L	32	-	32	1.12 - 1.23	2			1.23						1.12							
4,4´-DDE	72-55-9	c	NG/L	46	-	46	0.98 - 2.16	2	0.98		2.16													
4,4´-DDT	50-29-3	c	NG/L	230	-	230	0 - 0	0																
Aldrin	309-00-2	c	NG/L	0.92	-	0.92	0 - 0	0																
alpha-BHC	319-84-6	c	NG/L	7.2	-	7.2	0 - 0	0																
alpha-Chlordane	5103-71-9	c	NG/L	45	-	45	1.29 - 1.29	1																1.29
beta-BHC	319-85-7	c	NG/L	25	-	25	0 - 0	0																
delta-BHC	319-86-8	-	NG/L	-	-	-	0 - 0	0																
Dieldrin	60-57-1	c	NG/L	1.8	-	1.8	4.69 - 56.4	5					11 J		56.4			4.69 N		15.7			42.2	
Endosulfan I	959-98-8	n	NG/L	10000	-	10000	0 - 0	0																
Endosulfan II	33213-65-9	n	NG/L	10000	-	10000	0 - 0	0																
Endosulfan sulfate	1031-07-8	n	NG/L	10000	-	10000	0 - 0	0																
Endrin	72-20-8	n	NG/L	230	2000	230	0 - 0	0																
Endrin aldehyde	7421-93-4	n	NG/L	230	-	230	0 - 0	0																
Endrin ketone	53494-70-5	n	NG/L	230	-	230	0 - 0	0																
gamma-BHC (Lindane)	58-89-9	c	NG/L	42	200	42	0 - 0	0																
gamma-Chlordane	5103-74-2	c	NG/L	45	-	45	0 - 0	0																
Heptachlor	76-44-8	c	NG/L	1.4	400	1.4	0 - 0	0																
Heptachlor epoxide	1024-57-3	c	NG/L	1.4	200	1.4	1.02 - 1.02	1												1.02				
Methoxychlor	72-43-5	n	NG/L	3700	40000	3700	0 - 0	0																
Toxaphene	8001-35-2	c	NG/L	71	3000	71	48.3 - 48.3	1			48.3													

* USEPA Region III Regional Screening Level (RSL), November 2015
** Pennsylvania Maximum Contaminant Levels
Highlighted concentrations are over Project Screening Levels

Table 4-12a

Polychlorinated Biphenyls (PCBs) Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW08		MW14S		MW17S		MW17S-DUP		MW18S		MW26D		MW26S		MW38		MW39		MW41D		MW41D-DUP		MW41S		MW42		MW45	
											03/24/14		03/24/14		03/06/14		03/06/14		03/10/14		03/07/14		03/07/14		03/19/14		03/24/14		03/18/14		03/18/14		03/18/14		03/20/14		03/21/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-1	2051-60-7	PG/L	-	-	-	-	26	-	64000	10	360		65								11000		64000		12000				950		850		26		58		1800	
PCB-10	33146-45-1	PG/L	-	-	-	-	61	-	3600	6											920		3600		410				80		61						200	
PCB-103	60145-21-3	PG/L	-	-	-	-	0	-	0	0																												
PCB-104	56558-16-8	PG/L	-	-	-	-	0	-	0	0																												
PCB-105	32598-14-4	PG/L	c	4900	-	4900	42	-	77	2											77		42	J														
PCB-106	70424-69-0	PG/L	-	-	-	-	0	-	0	0																												
PCB-107	70424-68-9	PG/L	-	-	-	-	0	-	0	0																												
PCB-108/124	62-41-3/70424-7	PG/L	-	-	-	-	0	-	0	0																												
PCB-11	2050-67-1	PG/L	-	-	-	-	23	-	110	6											46		110		51				23		27						62	
PCB-110/115	80-03-9/74472-3	PG/L	-	-	-	-	29	-	460	7			46								460		370		29								98		45		61	
PCB-111	39635-32-0	PG/L	-	-	-	-	0	-	0	0																												
PCB-112	74472-36-9	PG/L	-	-	-	-	0	-	0	0																												
PCB-114	74472-37-0	PG/L	c	4000	-	4000	0	-	0	0																												
PCB-118	31508-00-6	PG/L	c	4000	-	4000	21	-	260	5			21								260		180										49				35	
PCB-12/13	74-92-7/2974-90	PG/L	-	-	-	-	30	-	980	5			39								180		980		30												120	
PCB-120	68194-12-7	PG/L	-	-	-	-	0	-	0	0																												
PCB-121	56558-18-0	PG/L	-	-	-	-	0	-	0	0																												
PCB-122	76842-07-4	PG/L	-	-	-	-	0	-	0	0																												
PCB-123	65510-44-3	PG/L	c	4000	-	4000	0	-	0	0																												
PCB-126	57465-28-8	PG/L	c	1.2	-	1.2	0	-	0	0																												
PCB-127	39635-33-1	PG/L	-	-	-	-	0	-	0	0																												
PCB-128/166	80-07-3/41411-6	PG/L	-	-	-	-	24	-	53	2											53	J											24	Z				
PCB-129/138/160/163	65-28-2/41411-6	PG/L	-	-	-	-	22	-	420	9			39		22		22				420		150		49								380		25		76	
PCB-130	52663-66-8	PG/L	-	-	-	-	0	-	0	0																												
PCB-131	61798-70-7	PG/L	-	-	-	-	0	-	0	0																												
PCB-132	38380-05-1	PG/L	-	-	-	-	29	-	160	5											160		45										110		37		29	
PCB-133	35694-04-3	PG/L	-	-	-	-	0	-	0	0																												
PCB-134/143	04-70-8/68194-1	PG/L	-	-	-	-	24	-	24	1											24																	
PCB-135/151/154	-5/52663-63-5/6	PG/L	-	-	-	-	23	-	210	7			23								190		49		42								210		80		43	
PCB-136	38411-22-2	PG/L	-	-	-	-	46	-	73	3											73												52		46			
PCB-137	35694-06-5	PG/L	-	-	-	-	0	-	0	0																												
PCB-139/140	30-56-9/59291-6	PG/L	-	-	-	-	0	-	0	0																												
PCB-14	34883-41-5	PG/L	-	-	-	-	0	-	0	0																												
PCB-141	52712-04-6	PG/L	-	-	-	-	92	-	95	2											95												92					
PCB-142	41411-61-4	PG/L	-	-	-	-	0	-	0	0																												
PCB-144	68194-14-9	PG/L	-	-	-	-	22	-	24	2											24												22					
PCB-145	74472-40-5	PG/L	-	-	-	-	0	-	0	0																												
PCB-146	51908-16-8	PG/L	-	-	-	-	22	-	78	3											78		22										72					
PCB-147/149	94-13-8/38380-0	PG/L	-	-	-	-	43	-	430	7			43								420		120		72								430		150		91	
PCB-148	74472-41-6	PG/L	-	-	-	-	0	-	0	0																												
PCB-15	2050-68-2	PG/L	-	-	-	-	23	-	4100	6			140								600		4100		230				23								370	
PCB-150	68194-08-1	PG/L	-	-	-	-	0	-	0	0																												
PCB-152	68194-09-2	PG/L	-	-	-	-	0	-	0	0																												
PCB-153/168	65-27-1/59291-6	PG/L	-	-	-	-	42	-	430	9			42		54		53				420		100		63								430		49		84	
PCB-155	33979-03-2	PG/L	-	-	-	-	0	-	0	0																												
PCB-156/157	80-08-4/69782-9	PG/L	-	-	-	-	0	-	0	0																												
PCB-158	74472-42-7	PG/L	-	-	-	-	30	-	41	2											41												30					
PCB-159	39635-35-3	PG/L	-	-	-	-	0	-	0	0																												
PCB-16	38444-78-9	PG/L	-	-	-	-	33	-	1300	6			94								510		1300		57										33		280	
PCB-161	74472-43-8	PG/L	-	-	-	-	0	-	0	0																												
PCB-162	39635-34-2	PG/L	-	-	-	-	0	-	0	0																												
PCB-164	74472-45-0	PG/L	-	-	-	-	29	-	32	2											29												32					
PCB-165	74472-46-1	PG/L	-	-	-	-	0	-	0	0																												
PCB-167	52663-72-6	PG/L	c	4000	-	4000	0	-	0	0																												
PCB-169	32774-16-6	PG/L	c	4	-	4	0	-	0	0																												

Table 4-12a

Polychlorinated Biphenyls (PCBs) Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW08		MW14S		MW17S		MW17S-DUP		MW18S		MW26D		MW26S		MW38		MW39		MW41D		MW41D-DUP		MW41S		MW42		MW45	
											03/24/14		03/24/14		03/06/14		03/06/14		03/10/14		03/07/14		03/07/14		03/19/14		03/24/14		03/18/14		03/18/14		03/18/14		03/20/14		03/21/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-17	37680-66-3	PG/L	-	-	-	-	25	-	4200	8			160								1300	J	4200		330				93				36		25		600	
PCB-170	35065-30-6	PG/L	-	-	-	-	30	-	190	3											110												190				30	
PCB-171/173	63-71-5/68194-1	PG/L	-	-	-	-	40	-	63	2											40												63					
PCB-172	52663-74-8	PG/L	-	-	-	-	23	-	38	2											23												38					
PCB-174	38411-25-5	PG/L	-	-	-	-	34	-	260	3											150												260				34	
PCB-175	40186-70-7	PG/L	-	-	-	-	0	-	0	0																												
PCB-176	52663-65-7	PG/L	-	-	-	-	27	-	27	1																							27					
PCB-177	52663-70-4	PG/L	-	-	-	-	50	-	150	2											50	J											150					
PCB-178	52663-67-9	PG/L	-	-	-	-	30	-	60	2											30												60					
PCB-179	52663-64-6	PG/L	-	-	-	-	62	-	110	2											62												110					
PCB-18/30	80-65-2/35693-9	PG/L	-	-	-	-	26	-	3700	9	26		240								1400		3700		180	J			63		29		46				860	
PCB-180/193	65-29-3/69782-9	PG/L	-	-	-	-	25	-	480	8			29		26		25				260		43		26								480				74	
PCB-181	74472-47-2	PG/L	-	-	-	-	0	-	0	0																												
PCB-182	60145-23-5	PG/L	-	-	-	-	0	-	0	0																												
PCB-183/185	63-69-1/52712-0	PG/L	-	-	-	-	23	-	160	3											100												160				23	
PCB-184	74472-48-3	PG/L	-	-	-	-	0	-	0	0																												
PCB-186	74472-49-4	PG/L	-	-	-	-	0	-	0	0																												
PCB-187	52663-68-0	PG/L	-	-	-	-	22	-	390	4											170	J			22								390				49	
PCB-188	74487-85-7	PG/L	-	-	-	-	0	-	0	0																												
PCB-189	39635-31-9	PG/L	c	4000	-	4000	0	-	0	0																												
PCB-19	38444-73-4	PG/L	-	-	-	-	24	-	5700	9			80								1900		5700		460		38		1100				140		24		790	
PCB-190	41411-64-7	PG/L	-	-	-	-	26	-	42	2											26												42					
PCB-191	74472-50-7	PG/L	-	-	-	-	0	-	0	0																												
PCB-192	74472-51-8	PG/L	-	-	-	-	0	-	0	0																												
PCB-194	35694-08-7	PG/L	-	-	-	-	57	-	130	2											57												130					
PCB-195	52663-78-2	PG/L	-	-	-	-	25	-	59	2											25												59					
PCB-196	42740-50-1	PG/L	-	-	-	-	33	-	70	2											33												70					
PCB-197/200	91-17-7/52663-7	PG/L	-	-	-	-	30	-	30	1																							30	J				
PCB-198/199	94-17-2/52663-7	PG/L	-	-	-	-	77	-	210	2											77												210					
PCB-2	2051-61-8	PG/L	-	-	-	-	29	-	2000	4											160		2000		97												29	
PCB-20/28	444-84-7/7012-3	PG/L	-	-	-	-	29	-	1900	7			160								1000		1900		99				29				32				460	
PCB-201	40186-71-8	PG/L	-	-	-	-	0	-	0	0																												
PCB-202	2136-99-4	PG/L	-	-	-	-	50	-	50	1																							50					
PCB-203	52663-76-0	PG/L	-	-	-	-	51	-	110	2											51												110					
PCB-204	74472-52-9	PG/L	-	-	-	-	0	-	0	0																												
PCB-205	74472-53-0	PG/L	-	-	-	-	0	-	0	0																												
PCB-206	40186-72-9	PG/L	-	-	-	-	37	-	370	2											37												370					
PCB-207	52663-79-3	PG/L	-	-	-	-	27	-	27	1																							27					
PCB-208	52663-77-1	PG/L	-	-	-	-	170	-	170	1																							170					
PCB-209	2051-24-3	PG/L	-	-	-	-	40	-	440	2											40												440					
PCB-21/33	02-46-0/38444-8	PG/L	-	-	-	-	30	-	700	5			59								340		700		30												160	
PCB-22	38444-85-8	PG/L	-	-	-	-	21	-	510	5			50								260		510		21												140	
PCB-23	55720-44-0	PG/L	-	-	-	-	0	-	0	0																												
PCB-24	55702-45-9	PG/L	-	-	-	-	67	-	67	1													67															
PCB-25	55712-37-3	PG/L	-	-	-	-	32	-	420	5			32								230		420		57												110	
PCB-26/29	44-81-4/15862-0	PG/L	-	-	-	-	55	-	790	5			55								370		790		73												160	
PCB-27	38444-76-7	PG/L	-	-	-	-	24	-	1200	7			42								420		1200		220				80				24				240	
PCB-3	2051-62-9	PG/L	-	-	-	-	24	-	11000	7	36		31								860		11000		120				24								170	
PCB-31	16606-02-3	PG/L	-	-	-	-	27	-	2100	7			160								980		2100		110				27				28				440	
PCB-32	38444-77-8	PG/L	-	-	-	-	23	-	2000	8			95								910		2000		190				52				23		27		380	
PCB-34	37680-68-5	PG/L	-	-	-	-	35	-	35	1													35															
PCB-35	37680-69-6	PG/L	-	-	-	-	0	-	0	0																												
PCB-36	38444-87-0	PG/L	-	-	-	-	0	-	0	0																												
PCB-37	38444-90-5	PG/L	-	-	-	-	31	-	170	3											73		170														31	
PCB-38	53555-66-1	PG/L	-	-	-	-	0	-	0	0																												

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW08		MW14S		MW17S		MW17S-DUP		MW18S		MW26D		MW26S		MW38		MW39		MW41D		MW41D-DUP		MW41S		MW42		MW45	
											03/24/14		03/24/14		03/06/14		03/06/14		03/10/14		03/07/14		03/07/14		03/19/14		03/24/14		03/18/14		03/18/14		03/18/14		03/20/14		03/21/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-39	38444-88-1	PG/L	-	-	-	-	0	-	0	0																												
PCB-4	13029-08-8	PG/L	-	-	-	-	150	-	74000	10	280		210								21000		74000		11000				1800		170		150		320		4700	
PCB-40/41/71	-8/52663-59-9/4	PG/L	-	-	-	-	23	-	630	8			54								390		630		24				23				28		87		110	
PCB-42	36559-22-5	PG/L	-	-	-	-	27	-	230	4			27								170		230														56	
PCB-43	70362-46-8	PG/L	-	-	-	-	39	-	52	2											39		52															
PCB-44/47/65	-5/2437-79-8/33	PG/L	-	-	-	-	24	-	1300	12	37		150						49		890		1300		110		130		100		24		110		120		330	
PCB-45/51	62-45-7/68194-0	PG/L	-	-	-	-	32	-	590	10			57								410		590		98		32		180		44		74		41		170	
PCB-46	41464-47-5	PG/L	-	-	-	-	22	-	160	5											92		160		22										47		38	
PCB-48	70362-47-9	PG/L	-	-	-	-	37	-	160	3											110		160														37	
PCB-49/69	64-40-8/60233-2	PG/L	-	-	-	-	49	-	890	7			82								600		890		70				49				51				200	
PCB-5	16605-91-7	PG/L	-	-	-	-	42	-	280	2											42		280															
PCB-50/53	96-65-0/41464-4	PG/L	-	-	-	-	45	-	600	8			50								380		600		200				95				45		64		200	
PCB-52	35693-99-3	PG/L	-	-	-	-	28	-	1500	9			140								1000		1500		110				47		28		82		110		260	
PCB-54	15968-05-5	PG/L	-	-	-	-	23	-	120	6											53		120		70				99				23				76	
PCB-55	74338-24-2	PG/L	-	-	-	-	0	-	0	0																												
PCB-56	41464-43-1	PG/L	-	-	-	-	35	-	160	3											130		160														35	
PCB-57	70424-67-8	PG/L	-	-	-	-	0	-	0	0																												
PCB-58	41464-49-7	PG/L	-	-	-	-	0	-	0	0																												
PCB-59/62/75	-6/54230-22-7/3	PG/L	-	-	-	-	59	-	89	2											59		89															
PCB-6	25569-80-6	PG/L	-	-	-	-	34	-	3300	7	34		110								840		3300		230	J			37								510	
PCB-60	33025-41-1	PG/L	-	-	-	-	26	-	40	2											26		40															
PCB-61/70/74/76	98-11-1/32690-9	PG/L	-	-	-	-	55	-	690	5			79								550		690										55				140	
PCB-63	74472-34-7	PG/L	-	-	-	-	26	-	26	1													26															
PCB-64	52663-58-8	PG/L	-	-	-	-	36	-	310	4			36								220		310														62	
PCB-66	32598-10-0	PG/L	-	-	-	-	28	-	370	5			37								290		370										28				78	
PCB-67	73575-53-8	PG/L	-	-	-	-	0	-	0	0																												
PCB-68	73575-52-7	PG/L	-	-	-	-	0	-	0	0																												
PCB-7	33284-50-3	PG/L	-	-	-	-	25	-	940	6					25				68		250		940		32												54	
PCB-72	41464-42-0	PG/L	-	-	-	-	0	-	0	0																												
PCB-73	74338-23-1	PG/L	-	-	-	-	0	-	0	0																												
PCB-77	32598-13-3	PG/L	c	6000	-	6000	0	-	0	0																												
PCB-78	70362-49-1	PG/L	-	-	-	-	0	-	0	0																												
PCB-79	41464-48-6	PG/L	-	-	-	-	0	-	0	0																												
PCB-8	34883-43-7	PG/L	-	-	-	-	68	-	13000	8	68		250								3000		13000		710	J			110		76						1300	
PCB-80	33284-52-5	PG/L	-	-	-	-	0	-	0	0																												
PCB-81	70362-50-4	PG/L	c	400	-	400	0	-	0	0																												
PCB-82	52663-62-4	PG/L	-	-	-	-	27	-	31	2											31		27															
PCB-83/99	45-20-2/38380-0	PG/L	-	-	-	-	23	-	290	6			23								290		240										48		23		40	
PCB-84	52663-60-2	PG/L	-	-	-	-	22	-	160	5											150		160										28		30		22	
PCB-85/116/117	-4/18259-05-7/6	PG/L	-	-	-	-	22	-	45	3											45		44												22			
PCB-86/87/97/109/119/1	02-8/41464-51-1/	PG/L	-	-	-	-	31	-	250	6			31								250		230										52		33		38	
PCB-88/91	15-17-3/68194-0	PG/L	-	-	-	-	43	-	85	3											85		77												43			
PCB-89	73575-57-2	PG/L	-	-	-	-	0	-	0	0																												
PCB-9	34883-39-1	PG/L	-	-	-	-	24	-	1000	4											190		1000		24												57	
PCB-90/101/113	-0/37680-73-2/6	PG/L	-	-	-	-	48	-	490	7			59								490		360		48								110		76		77	
PCB-92	52663-61-3	PG/L	-	-	-	-	25	-	100	3											100		88										25					
PCB-93/95/98/100/102	99-6/60233-25-2/	PG/L	-	-	-	-	30	-	580	8			76								580		500		56				30				140		240		96	
PCB-94	73575-55-0	PG/L	-	-	-	-	0	-	0	0																												
PCB-96	73575-54-9	PG/L	-	-	-	-	29	-	29	1																									29			
TEQ	2222-22-2	PG/L	-	0.1	-	0.1	0	-	0.01	14	0		0.00063		0		0		0		0.01		0.0067		0		0		0		0		0.0015		0		0.0011	
Total PCBs	1111-11-1	PG/L	-	44000	-	44000	100	-	210000	14	840		3200		130		100		120		60000		210000		28000		230		5100		1300		7100		1900		17000	

Table 4-12b

Polychlorinated Biphenyls (PCBs) Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW08	MW14S		MW17S	MW17S-DUP	MW18S	MW24	MW25	MW26D	MW26S	MW38	MW39	MW41D	MW41D-DUP	MW42
									Result	Result		Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
PCB-1	2051-60-7	pg/L	-	-	-	-	6.2 - 68000	13	6.2 Z	39		42	50	82	17 J		6000	68000	31000	9.2 J	1100	1100	200
PCB-10	33146-45-1	pg/L	-	-	-	-	65 - 2800	5									390	2800	1900		66 Z	65	
PCB-103	60145-21-3	pg/L	-	-	-	-	5.6 - 5.6	1									5.6 J						
PCB-104	56558-16-8	pg/L	-	-	-	-	3.1 - 3.1	1										3.1 Z					
PCB-105	32598-14-4	pg/L	c	4900	-	4900	2 - 380	7	6.8 J						380	35	6.2 J	27		63	2 Z		
PCB-106	70424-69-0	pg/L	-	-	-	-	0 - 0	0															
PCB-107/PCB-124	PCB107_124	pg/L	-	-	-	-	32 - 32	1							32								
PCB-109	74472-35-8	pg/L	-	-	-	-	4 - 69	3							69	4 Z		10 Z					
PCB-11	2050-67-1	pg/L	-	-	-	-	27 - 1300	8	150 Z		J+	120 J+	120 J+				1200 J+	1300 J+			30	27	140 J+
PCB-110/PCB-115	PCB110_115	pg/L	-	-	-	-	8.9 - 1700	11	76	38					1700	130	92	240	25	180	10 Z	8.9 J	58
PCB-111	39635-32-0	pg/L	-	-	-	-	0 - 0	0															
PCB-112	74472-36-9	pg/L	-	-	-	-	0 - 0	0															
PCB-114	74472-37-0	pg/L	c	4000	-	4000	0 - 0	0															
PCB-118	31508-00-6	pg/L	c	4000	-	4000	2.8 - 1000	13	17 Z	17 J		4.5 Z		2.8 Z	1000	86	32	120	5.7 Z	130	5.9 Z	3.6 Z	9.2 J
PCB-12/PCB-13	PCB12_13	pg/L	-	-	-	-	840 - 840	1										840					
PCB-120	68194-12-7	pg/L	-	-	-	-	0 - 0	0															
PCB-121	56558-18-0	pg/L	-	-	-	-	0 - 0	0															
PCB-122	76842-07-4	pg/L	-	-	-	-	0 - 0	0															
PCB-123	65510-44-3	pg/L	c	4000	-	4000	0 - 0	0															
PCB-126	57465-28-8	pg/L	c	1.2	-	1.2	0 - 0	0															
PCB-127	39635-33-1	pg/L	-	-	-	-	0 - 0	0															
PCB-128/PCB-166	PCB128_166	pg/L	-	-	-	-	4 - 230	6	28						230	27	4 Z	8.8 J		38			
PCB-129/PCB-138/PCB-16	PCB129_138_16	pg/L	-	-	-	-	4.8 - 1700	14	180	37	J	19 J	16 J	4.8 J	1700	210	37	88	40	230	8.2 J	4.9 J	32
PCB-130	52663-66-8	pg/L	-	-	-	-	13 - 99	2							99					13 Z			
PCB-131	61798-70-7	pg/L	-	-	-	-	0 - 0	0															
PCB-132	38380-05-1	pg/L	-	-	-	-	11 - 600	9	50	11 J					600	69	17 Z	35	13 J	72			57
PCB-133	35694-04-3	pg/L	-	-	-	-	0 - 0	0															
PCB-134/PCB-143	PCB134_143	pg/L	-	-	-	-	7.4 - 91	3							91	11 J				7.4 J			
PCB-135/PCB-151	PCB135_151	pg/L	-	-	-	-	2.5 - 690	11	68	20					690	87	27	38	31	43	2.5 Z	3.5 Z	130
PCB-136	38411-22-2	pg/L	-	-	-	-	1.8 - 280	11	27	6.2 J					280	31	13 J	18 J	9.8 Z	20	2.1 J	1.8 Z	83
PCB-137	35694-06-5	pg/L	-	-	-	-	5 - 74	3	5 J						74					8.9 J			
PCB-139/PCB-140	PCB139_140	pg/L	-	-	-	-	25 - 25	1							25								
PCB-14	34883-41-5	pg/L	-	-	-	-	0 - 0	0															
PCB-141	52712-04-6	pg/L	-	-	-	-	11 - 350	8	29	11 J					350	54		15 J	14 J	36			24
PCB-142	41411-61-4	pg/L	-	-	-	-	0 - 0	0															
PCB-144	68194-14-9	pg/L	-	-	-	-	3.3 - 96	5							96	13 J		3.3 Z		7.7 J			15 J
PCB-145	74472-40-5	pg/L	-	-	-	-	0 - 0	0															
PCB-146	51908-16-8	pg/L	-	-	-	-	5.1 - 230	8	28	7 J					230	25	5.1 Z	17 J	8.1 J				14 J
PCB-147/PCB-149	PCB147_149	pg/L	-	-	-	-	4.2 - 1600	12	190	37	Z			4.2 J	1600	190	60	98	60	110	10 Z	9 J	260
PCB-148	74472-41-6	pg/L	-	-	-	-	0 - 0	0															
PCB-15	2050-68-2	pg/L	-	-	-	-	91 - 2700	4							91		120	2700	290				
PCB-150	68194-08-1	pg/L	-	-	-	-	0 - 0	0															
PCB-152	68194-09-2	pg/L	-	-	-	-	0 - 0	0															
PCB-153/PCB-168	PCB153_168	pg/L	-	-	-	-	4.8 - 1400	14	130	35	Z	60	41	4.8 Z	1400	180	43	79	53	120	7.2 J	5 Z	71
PCB-154	60145-22-4	pg/L	-	-	-	-	0 - 0	0															
PCB-155	33979-03-2	pg/L	-	-	-	-	0 - 0	0															
PCB-156/PCB-157	PCB156_157	pg/L	-	-	-	-	7.3 - 180	5	12 J						180	19 J		7.3 J		31			
PCB-158	74472-42-7	pg/L	-	-	-	-	2.5 - 170	6	18 J						170	19 J		5.5 J	2.5 Z	20			
PCB-159	39635-35-3	pg/L	-	-	-	-	16 - 16	1							16 Z								
PCB-16	38444-78-9	pg/L	-	-	-	-	4.5 - 1200	8							300	4.5 J	230	1200	110		7.9 Z	8.1 J	62
PCB-160	41411-62-5	pg/L	-	-	-	-	0 - 0	0															
PCB-161	74472-43-8	pg/L	-	-	-	-	15 - 15	1												15 Z			
PCB-162	39635-34-2	pg/L	-	-	-	-	2.9 - 2.9	1							2.9 Z								

Polychlorinated Biphenyls (PCBs) Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW08		MW14S			MW17S		MW17S-DUP		MW18S		MW24		MW25		MW26D		MW26S		MW38		MW39		MW41D		MW41D-DUP		MW42	
											Result		Result			Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
PCB-164	74472-45-0	pg/L	-	-	-	-	5.6	-	110	6	12	J										110		12	Z			5.6	Z			11	J					8.3	Z
PCB-165	74472-46-1	pg/L	-	-	-	-	0	-	0	0																													
PCB-167	52663-72-6	pg/L	c	4000	-	4000	4.8	-	52	3												52		4.8	J							9.5	Z						
PCB-169	32774-16-6	pg/L	c	4	-	4	0	-	0	0																													
PCB-17	37680-66-3	pg/L	-	-	-	-	7.4	-	3100	10			18	Z	J					16	J	250		7.4	J	610		3100		550				14	J	14	J	54	
PCB-170	35065-30-6	pg/L	-	-	-	-	3.5	-	400	8	170		9.3	J								400		66		3.5	Z	10	Z	6.5	Z	44							
PCB-171/PCB-173	PCB171_173	pg/L	-	-	-	-	3.4	-	160	5	44	Z										160		19	J			3.4	J			15	Z						
PCB-172	52663-74-8	pg/L	-	-	-	-	2.1	-	73	6	23	Z										73		7.8	Z			2.1	J	2.3	Z	8.7	J						
PCB-174	38411-25-5	pg/L	-	-	-	-	2.8	-	620	11	160		11	Z								620		96		8.7	Z	12	J	14	J	50		3.4	Z	2.8	Z	3.3	Z
PCB-175	40186-70-7	pg/L	-	-	-	-	18	-	18	1												18	J																
PCB-176	52663-65-7	pg/L	-	-	-	-	11	-	65	3	12	J										65		11	J														
PCB-177	52663-70-4	pg/L	-	-	-	-	1.7	-	320	8	89											320		47		3.4	J	5.3	J	5.9	Z	24						1.7	Z
PCB-178	52663-67-9	pg/L	-	-	-	-	6.1	-	93	4	26											93		17	J							6.1	Z						
PCB-179	52663-64-6	pg/L	-	-	-	-	3.7	-	240	8	54		3.7	J								240		40		4.3	J	6.6	J	5.9	Z	11	Z						
PCB-18/PCB-30	PCB18_30	pg/L	-	-	-	-	5.8	-	3100	13	13	Z	36					8.1	J	23		580		12	J	620		3100		610		5.8	J	22		21		30	
PCB-180/PCB-193	PCB180_193	pg/L	-	-	-	-	2.2	-	1000	13	390		23			17	J	24				1000		160		13	J	28		18	J	130		4.5	J	2.2	Z	8.9	J
PCB-181	74472-47-2	pg/L	-	-	-	-	0	-	0	0																													
PCB-182	60145-23-5	pg/L	-	-	-	-	0	-	0	0																													
PCB-183	52663-69-1	pg/L	-	-	-	-	2.1	-	300	10	74		6.8	Z								300		43		4.8	J	7	J	5.4	J	24		2.1	Z			3	Z
PCB-184	74472-48-3	pg/L	-	-	-	-	0	-	0	0																													
PCB-185	52712-05-7	pg/L	-	-	-	-	6.3	-	55	3	24											55	Z	6.3	J														
PCB-186	74472-49-4	pg/L	-	-	-	-	0	-	0	0																													
PCB-187	52663-68-0	pg/L	-	-	-	-	3.2	-	580	10	170		14	J								580		110		10	J	17	J	17	Z	47		3.2	Z			7.7	J
PCB-188	74487-85-7	pg/L	-	-	-	-	0	-	0	0																													
PCB-189	39635-31-9	pg/L	c	4000	-	4000	14	-	14	1												14	J																
PCB-19	38444-73-4	pg/L	-	-	-	-	14	-	5300	12			14	Z				130		49	J	170		83	J	830		5300		3100		22		18	J	21		87	
PCB-190	41411-64-7	pg/L	-	-	-	-	1.5	-	75	5	26											75		13	Z			1.5	Z			5.1	J						
PCB-191	74472-50-7	pg/L	-	-	-	-	2.9	-	14	2												14	J									2.9	Z						
PCB-192	74472-51-8	pg/L	-	-	-	-	0	-	0	0																													
PCB-194	35694-08-7	pg/L	-	-	-	-	4.5	-	210	5	91											210		41				4.5	J			22							
PCB-195	52663-78-2	pg/L	-	-	-	-	6.2	-	67	4	30											67		15	Z							6.2	J						
PCB-196	42740-50-1	pg/L	-	-	-	-	20	-	130	4	56											130		24								20							
PCB-197	33091-17-7	pg/L	-	-	-	-	10	-	10	1												10	J																
PCB-198/PCB-199	PCB198_199	pg/L	-	-	-	-	4.6	-	320	5	160											320		58				4.6	Z			65							
PCB-2	2051-61-8	pg/L	-	-	-	-	12	-	1400	3																		1400						14	J	12	Z		
PCB-20/PCB-28	PCB20_28	pg/L	-	-	-	-	12	-	1400	9			37		Z					16	Z	500		12	Z	310		1400		160				15	J	13	J		
PCB-200	52663-73-7	pg/L	-	-	-	-	7.2	-	37	3	16	J										37		7.2	J														
PCB-201	40186-71-8	pg/L	-	-	-	-	3.5	-	42	4	15	J										42		6	J							3.5	J						
PCB-202	2136-99-4	pg/L	-	-	-	-	7.1	-	65	4	28											65		10	J							7.1	J						
PCB-203	52663-76-0	pg/L	-	-	-	-	1.8	-	200	5	92											200		34				1.8	Z			40							
PCB-204	74472-52-9	pg/L	-	-	-	-	0	-	0	0																													
PCB-205	74472-53-0	pg/L	-	-	-	-	8.3	-	8.3	1												8.3	J																
PCB-206	40186-72-9	pg/L	-	-	-	-	4.1	-	220	5	210											220		37								33						4.1	Z
PCB-207	52663-79-3	pg/L	-	-	-	-	3.9	-	26	4	19	J										26		3.9	Z							4.1	Z						
PCB-208	52663-77-1	pg/L	-	-	-	-	12	-	86	4	86											67		13	J							12	J						
PCB-209	2051-24-3	pg/L	-	-	-	-	6.1	-	350	4	350											120		52								6.1	J						
PCB-21/PCB-33	PCB21_33	pg/L	-	-	-	-	5.9	-	540	8			13	J								270		6.1	Z	120		540		43	Z			5.9	J	6.7	Z		
PCB-22	38444-85-8	pg/L	-	-	-	-	4.3	-	420	7			13	J								70				76		420		24				4.5	Z	4.3	Z		
PCB-23	55720-44-0	pg/L	-	-	-	-	0	-	0	0																													
PCB-24	55702-45-9	pg/L	-	-	-	-	2.1	-	2.1	1																										2.1	Z		
PCB-25	55712-37-3	pg/L	-	-	-	-	36	-	370	4												36				79		370		90									
PCB-26/PCB-29	PCB26_29	pg/L	-	-	-	-	3.1	-	700	6			9.9	J								97				120		700		100				3.1	J				
PCB-27	38444-76-7	pg/L	-	-	-	-	3.9	-	970	8												47		4.5	J	180		970		500				3.9	Z	3.9	J	29	

Polychlorinated Biphenyls (PCBs) Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW08	MW14S		MW17S	MW17S-DUP	MW18S	MW24	MW25	MW26D	MW26S	MW38	MW39	MW41D	MW41D-DUP	MW42
									Result	Result		Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
PCB-3	2051-62-9	pg/L	-	-	-	-	5.2 - 10000	8				7.9 Z		6.5 J	5.2 Z		190	10000	780		20 Z	23	
PCB-31	16606-02-3	pg/L	-	-	-	-	9.5 - 1700	9		33	Z			11 J	450	12 J	300	1700	160		9.7 J	9.5 Z	
PCB-32	38444-77-8	pg/L	-	-	-	-	3.9 - 1500	9		10 Z	Z				130	3.9 J	310	1500	260		9.6 J	9.4 Z	42
PCB-34	37680-68-5	pg/L	-	-	-	-	0 - 0	0															
PCB-35	37680-69-6	pg/L	-	-	-	-	0 - 0	0															
PCB-36	38444-87-0	pg/L	-	-	-	-	27 - 27	1							27								
PCB-37	38444-90-5	pg/L	-	-	-	-	110 - 120	2							110			120					
PCB-38	53555-66-1	pg/L	-	-	-	-	0 - 0	0															
PCB-39	38444-88-1	pg/L	-	-	-	-	0 - 0	0															
PCB-4	13029-08-8	pg/L	-	-	-	-	120 - 66000	9					350		560	120	8000	66000	53000		190 Z	170 Z	600
PCB-40/PCB-71	PCB40_71	pg/L	-	-	-	-	5.4 - 440	10		19 J					210	11 J	130	440	30	5.4 Z	7.6 J	6.9 Z	130
PCB-41	52663-59-9	pg/L	-	-	-	-	2 - 31	4							31			25			2 Z		7.9 Z
PCB-42	36559-22-5	pg/L	-	-	-	-	3.9 - 190	9		9.4 Z					120	4.3 Z	57	190	16 Z		3.9 Z	4.2 J	24
PCB-43	70362-46-8	pg/L	-	-	-	-	18 - 52	3							31 Z		18 Z	52					
PCB-44/PCB-47/PCB-65	PCB44_47_65	pg/L	-	-	-	-	26 - 1100	14	67	140		34	47	60	770	120	350	1100	170	200	26	34 Z	180
PCB-45	70362-45-7	pg/L	-	-	-	-	2.1 - 200	8		12 J					87	2.1 Z	60	200	25 Z		2.3 J		24
PCB-46	41464-47-5	pg/L	-	-	-	-	37 - 140	5							37		46	140	42				77
PCB-48	70362-47-9	pg/L	-	-	-	-	2.6 - 140	6							93		45	140			2.6 Z	3 Z	4.9 Z
PCB-49/PCB-69	PCB49_69	pg/L	-	-	-	-	8.6 - 750	11		32	Z			8.6 Z	410	21	220	750	130	12 Z	8.6 Z	8.7 Z	22
PCB-5	16605-91-7	pg/L	-	-	-	-	720 - 720	1										720					
PCB-50/PCB-53	PCB50_53	pg/L	-	-	-	-	6.2 - 490	11		10 J				6.2 J	97	9.4 Z	180	490	280	6.7 Z	8.1 J	6.9 J	120
PCB-51	68194-04-7	pg/L	-	-	-	-	16 - 340	12		16 J			32	21 Z	53	25	130	340	140	32	41	39	49
PCB-52	35693-99-3	pg/L	-	-	-	-	12 - 1400	14	19 Z	84	J	14 Z	13 J	12 J	1400	73	430	1400	220	52	27	25	210
PCB-54	15968-05-5	pg/L	-	-	-	-	1.6 - 100	10					11 J	3.7 J	9.5 J	7 J	21	94	100 Z		1.6 Z	2 Z	28
PCB-55	74338-24-2	pg/L	-	-	-	-	0 - 0	0															
PCB-56	41464-43-1	pg/L	-	-	-	-	4.4 - 150	6							150	7.3 Z	24	130			4.4 Z	4.6 Z	
PCB-57	70424-67-8	pg/L	-	-	-	-	30 - 30	1							30								
PCB-58	41464-49-7	pg/L	-	-	-	-	0 - 0	0															
PCB-59/PCB-62/PCB-75	PCB59_62_75	pg/L	-	-	-	-	22 - 70	3							39		22	70					
PCB-6	25569-80-6	pg/L	-	-	-	-	88 - 3500	4							88		270	3500	1600				
PCB-60	33025-41-1	pg/L	-	-	-	-	25 - 73	2							73			25 Z					
PCB-61/PCB-70/PCB-74/P	CB61_70_74_7	pg/L	-	-	-	-	13 - 940	9		45					940	55	130	550	19	37	16 J	13 J	
PCB-63	74472-34-7	pg/L	-	-	-	-	4.5 - 20	3							9.9 Z		4.5 J	20 J					
PCB-64	52663-58-8	pg/L	-	-	-	-	4.5 - 230	9		17 J					210	9.6 J	70	230	14 J	5.9 Z	5.1 Z	4.5 J	
PCB-66	32598-10-0	pg/L	-	-	-	-	5 - 430	9		23					430	13 J	72	330	16 J	11 Z	6.4 Z	5 Z	
PCB-67	73575-53-8	pg/L	-	-	-	-	11 - 11	1										11 Z					
PCB-68	73575-52-7	pg/L	-	-	-	-	3.7 - 13	7			J				12 J	4.6 Z	3.7 Z	13 Z	5.1 Z		8.6 J	9.1 J	
PCB-7	33284-50-3	pg/L	-	-	-	-	67 - 710	3									67	710	170				
PCB-72	41464-42-0	pg/L	-	-	-	-	12 - 12	1										12 Z					
PCB-73	74338-23-1	pg/L	-	-	-	-	18 - 18	1										18 J					
PCB-77	32598-13-3	pg/L	c	6000	-	6000	26 - 26	1							26								
PCB-78	70362-49-1	pg/L	-	-	-	-	0 - 0	0															
PCB-79	41464-48-6	pg/L	-	-	-	-	0 - 0	0															
PCB-8	34883-43-7	pg/L	-	-	-	-	99 - 11000	6							310		1000	11000	4700		110 Z	99 Z	
PCB-80	33284-52-5	pg/L	-	-	-	-	0 - 0	0															
PCB-81	70362-50-4	pg/L	c	400	-	400	0 - 0	0															
PCB-82	52663-62-4	pg/L	-	-	-	-	11 - 160	5							160	11 J		25		17 J			12 J
PCB-83	60145-20-2	pg/L	-	-	-	-	0 - 0	0															
PCB-84	52663-60-2	pg/L	-	-	-	-	2.9 - 470	9		12 J					470	32	44	110	5.9 Z	38	2.9 J		39
PCB-85/PCB-116/PCB-117	PCB85_116_117	pg/L	-	-	-	-	13 - 180	5							180	13 J		26		15 Z			29
PCB-86/PCB-87/PCB-97/P	PCBCONGPK302	pg/L	-	-	-	-	3.7 - 970	12	22	26				3.7 J	970	69	50	130	13 Z	100	6.8 Z	6.9 J	43
PCB-88	55215-17-3	pg/L	-	-	-	-	7.5 - 7.5	1	NA	NA		NA	NA	NA	NA	NA	NA	NA	7.5 Z	NA		NA	NA
PCB-88/PCB-91	PCB88_91	pg/L	-	-	-	-	7.5 - 200	8	9 Z						200	12 J	22	56	7.5 Z	14 J			57

Table 4-12b

Polychlorinated Biphenyls (PCBs) Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW08	MW14S		MW17S	MW17S-DUP	MW18S	MW24	MW25	MW26D	MW26S	MW38	MW39	MW41D	MW41D-DUP	MW42
									Result	Result		Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
PCB-89	73575-57-2	pg/L	-	-	-	-	12 - 12	1															12 J
PCB-9	34883-39-1	pg/L	-	-	-	-	61 - 1000	3									61 Z	1000	140 Z				
PCB-90/PCB-101/PCB-113	PCB90_101_113	pg/L	-	-	-	-	5 - 1700	12	46	43				5 J	1700	130	100	230	52	130	10 J	11 J	100
PCB-91	68194-05-8	pg/L	-	-	-	-	7.5 - 7.5	1	NA	NA		NA	NA	NA	NA	NA	NA	NA	7.5 Z	NA		NA	NA
PCB-92	52663-61-3	pg/L	-	-	-	-	8.5 - 300	9	11 Z	8.5 Z					300	21	25	60	18 J	22			17 J
PCB-93/PCB-100	PCB93_100	pg/L	-	-	-	-	14 - 21	2	14 Z									21					
PCB-94	73575-55-0	pg/L	-	-	-	-	0 - 0	0															
PCB-95	38379-99-6	pg/L	-	-	-	-	4.6 - 1600	12	45	48				4.6 J	1600	100	150	310	59	110	13 J	11 Z	350
PCB-96	73575-54-9	pg/L	-	-	-	-	4.4 - 50	4							10 J		4.4 Z	7.4 Z					50
PCB-98/PCB-102	PCB98_102	pg/L	-	-	-	-	3.4 - 24	4									16 Z	24	3.4 Z				9.5 J
PCB-99	38380-01-7	pg/L	-	-	-	-	2.5 - 730	11	15 J	9.8 J					730	49	44	130	17 J	44	3.1 Z	2.5 Z	23
Total DiCB	25512-42-9	pg/L	-	-	-	-	120 - 95000	11	150 Z			120	470		2200	120	11000 Z	95000	62000 Z		390 Z	360 Z	750
Total HpCB	28655-71-2	pg/L	-	-	-	-	5 - 4000	13	1300 Z	67 Z		17 J	24		4000 Z	640 Z	48 Z	93 Z	74 Z	360 Z	13 Z	5 Z	25 Z
Total HxCB	26601-64-9	pg/L	-	-	-	-	14 - 8000	14	770	160	Z	79	56	14 Z	8000 Z	950 Z	210 Z	420 Z	230 Z	800 Z	30 Z	24 Z	690 Z
Total MoCB	27323-18-8	pg/L	-	-	-	-	6.2 - 83000	13	6.2 Z	39		50 Z	50	89	22 Z		6100	83000	30000	9.2 J	1200 Z	1200 Z	200
Total NoCB	53742-07-7	pg/L	-	-	-	-	4.1 - 310	5	310						310	54 Z				49 Z			4.1 Z
Total OcCB	55722-26-4	pg/L	-	-	-	-	11 - 1100	5	490 Z						1100	200 Z		11 Z		160			
Total PCBs	1111-11-1	pg/L	-	44000	-	44,000	400 - 210000	11	3800	1100 Z	Z	400 Z	890 Z	520 Z	34000 Z	3200 Z	24000 Z	210000 Z	NA	2800 Z	NA	NA	3700 Z
Total PeCB	25429-29-2	pg/L	-	-	-	-	16 - 9500	12	260 Z	200 Z				16 Z	9500	690 Z	590 Z	1500 Z	210 Z	870 Z	54 Z	44 Z	810
Total TeCB	26914-33-0	pg/L	-	-	-	-	66 - 6700	14	120 Z	410 Z	Z	66 Z	120 Z	110 Z	5200 Z	360 Z	2000 Z	6700 Z	1200 Z	360 Z	170 Z	170 Z	880 Z
Total TEQ	2222-22-2	pg/L	-	0.1	-	0.1	8E-05 - 0.052	13	0.0011	0.00052		0.00013		0.000084	0.052	0.0043	0.0012	0.0046	0.00017	0.0069	0.00024	0.00011	0.00028
Total TrCB	25323-68-6	pg/L	-	-	-	-	28 - 20000	14	35 Z	180 Z	Z	61 Z	160	110 Z	3000	140 Z	3800 Z	20000	5700 Z	28	110 Z	110 Z	320 Z

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-13a

Dioxins Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW08		MW14S		MW15S		MW17S		MW17S-DUP		MW18S		MW26D		MW26S		MW38		MW39	
											03/24/14		03/24/14		03/05/14		03/06/14		03/06/14		03/10/14		03/07/14		03/07/14		03/19/14		03/24/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,2,3,4,6,7,8-HpCDD	35822-46-9	PG/L	-	-	-	-	0	-	0	0																				
1,2,3,4,6,7,8-HpCDF	67562-39-4	PG/L	-	-	-	-	0	-	0	0																				
1,2,3,4,7,8,9-HpCDF	55673-89-7	PG/L	-	-	-	-	0	-	0	0																				
1,2,3,4,7,8-HxCDD	39227-28-6	PG/L	-	-	-	-	0	-	0	0																				
1,2,3,4,7,8-HxCDF	70648-26-9	PG/L	-	-	-	-	0	-	0	0																				
1,2,3,6,7,8-HxCDD	57653-85-7	PG/L	-	-	-	-	0	-	0	0																				
1,2,3,6,7,8-HxCDF	57117-44-9	PG/L	-	-	-	-	0	-	0	0																				
1,2,3,7,8,9-HxCDD	19408-74-3	PG/L	-	-	-	-	0	-	0	0																				
1,2,3,7,8,9-HxCDF	72918-21-9	PG/L	-	-	-	-	0	-	0	0																				
1,2,3,7,8-PeCDD	40321-76-4	PG/L	-	-	-	-	0	-	0	0																				
1,2,3,7,8-PeCDF	57117-41-6	PG/L	-	-	-	-	0	-	0	0																				
2,3,4,6,7,8-HxCDF	60851-34-5	PG/L	-	-	-	-	0	-	0	0																				
2,3,4,7,8-PeCDF	57117-31-4	PG/L	-	-	-	-	0	-	0	0																				
2,3,7,8-TCDD	1746-01-6	PG/L	c	0.12	30	0.12	0	-	0	0																				
2,3,7,8-TCDF	51207-31-9	PG/L	-	-	-	-	0	-	0	0																				
OCDD	3268-87-9	PG/L	-	-	-	-	120	-	510	3					510								120							
OCDF	39001-02-0	PG/L	-	-	-	-	0	-	0	0																				
TEQ WHO1998 Bird ND=0	TEQ	PG/L	-	-	-	-	0	-	0.051	15	0		0		0.051		0		0		0		0.012		0		0		0	
TEQ WHO1998 Fish ND=0	TEQ	PG/L	-	-	-	-	0	-	0.051	15	0		0		0.051		0		0		0		0.012		0		0		0	
TEQ WHO2005 ND=0	TEQ	PG/L	c	0.12	30	0.12	0	-	0.15	15	0		0		0.15		0		0		0		0.036		0		0		0	
Total HpCDD	37871-00-4	PG/L	-	-	-	-	220	-	220	1					220															
Total HpCDF	38998-75-3	PG/L	-	-	-	-	0	-	0	0																				
Total HxCDD	34465-46-8	PG/L	-	-	-	-	1900	-	1900	1					1900															
Total HxCDF	55684-94-1	PG/L	-	-	-	-	0	-	0	0																				
Total PeCDD	36088-22-9	PG/L	-	-	-	-	790	-	790	1					790															
Total PeCDF	30402-15-4	PG/L	-	-	-	-	0	-	0	0																				
Total TCDD	41903-57-5	PG/L	-	-	-	-	13	-	990	2			13		990															
Total TCDF	55722-27-5	PG/L	-	-	-	-	0	-	0	0																				

Table 4-13a

Dioxins Detected in Shallow Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW41D		MW41D-DUP		MW41S		MW42		MW45	
											03/18/14		03/18/14		03/18/14		03/20/14		03/21/14	
											Result	Flag	Result	Flag	Result	Flag	Resul	Flag	Result	Flag
1,2,3,4,6,7,8-HpCDD	35822-46-9	PG/L	-	-	-	-	0	-	0	0										
1,2,3,4,6,7,8-HpCDF	67562-39-4	PG/L	-	-	-	-	0	-	0	0										
1,2,3,4,7,8,9-HpCDF	55673-89-7	PG/L	-	-	-	-	0	-	0	0										
1,2,3,4,7,8-HxCDD	39227-28-6	PG/L	-	-	-	-	0	-	0	0										
1,2,3,4,7,8-HxCDF	70648-26-9	PG/L	-	-	-	-	0	-	0	0										
1,2,3,6,7,8-HxCDD	57653-85-7	PG/L	-	-	-	-	0	-	0	0										
1,2,3,6,7,8-HxCDF	57117-44-9	PG/L	-	-	-	-	0	-	0	0										
1,2,3,7,8,9-HxCDD	19408-74-3	PG/L	-	-	-	-	0	-	0	0										
1,2,3,7,8,9-HxCDF	72918-21-9	PG/L	-	-	-	-	0	-	0	0										
1,2,3,7,8-PeCDD	40321-76-4	PG/L	-	-	-	-	0	-	0	0										
1,2,3,7,8-PeCDF	57117-41-6	PG/L	-	-	-	-	0	-	0	0										
2,3,4,6,7,8-HxCDF	60851-34-5	PG/L	-	-	-	-	0	-	0	0										
2,3,4,7,8-PeCDF	57117-31-4	PG/L	-	-	-	-	0	-	0	0										
2,3,7,8-TCDD	1746-01-6	PG/L	c	0.12	30	0.12	0	-	0	0										
2,3,7,8-TCDF	51207-31-9	PG/L	-	-	-	-	0	-	0	0										
OCDD	3268-87-9	PG/L	-	-	-	-	120	-	510	3					390					
OCDF	39001-02-0	PG/L	-	-	-	-	0	-	0	0										
TEQ WHO1998 Bird ND=0	TEQ	PG/L	-	-	-	-	0	-	0.051	15	0		0		0.04		0		0	
TEQ WHO1998 Fish ND=0	TEQ	PG/L	-	-	-	-	0	-	0.051	15	0		0		0.04		0		0	
TEQ WHO2005 ND=0	TEQ	PG/L	c	0.12	30	0.12	0	-	0.15	15	0		0		0.12		0		0	
Total HpCDD	37871-00-4	PG/L	-	-	-	-	220	-	220	1										
Total HpCDF	38998-75-3	PG/L	-	-	-	-	0	-	0	0										
Total HxCDD	34465-46-8	PG/L	-	-	-	-	1900	-	1900	1										
Total HxCDF	55684-94-1	PG/L	-	-	-	-	0	-	0	0										
Total PeCDD	36088-22-9	PG/L	-	-	-	-	790	-	790	1										
Total PeCDF	30402-15-4	PG/L	-	-	-	-	0	-	0	0										
Total TCDD	41903-57-5	PG/L	-	-	-	-	13	-	990	2										
Total TCDF	55722-27-5	PG/L	-	-	-	-	0	-	0	0										

Table 4-13b

Dioxins Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW08	MW14S	MW15S	MW17S	MW17S-DUP	MW18S	MW24	MW25	MW26D	MW26S	MW38	MW39	MW41D	MW41D-DUP	MW42
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,2,3,4,6,7,8-HpCDD	35822-46-9	pg/L	-	-	-	-	2.21 - 39.1	5	5.17 J	2.21 Z		3.96 J			39.1 J	9.97 Z							
1,2,3,4,6,7,8-HpCDF	67562-39-4	pg/L	-	-	-	-	5.09 - 18	2							18 J	5.09 Z							
1,2,3,4,7,8,9-HpCDF	55673-89-7	pg/L	-	-	-	-	0 - 0	0															
1,2,3,4,7,8-HxCDD	39227-28-6	pg/L	-	-	-	-	1.07 - 1.07	1										1.07 Z					
1,2,3,4,7,8-HxCDF	70648-26-9	pg/L	-	-	-	-	1.42 - 5.32	2							5.32 Z			1.42 J					
1,2,3,6,7,8-HxCDD	57653-85-7	pg/L	-	-	-	-	0.901 - 1.49	2				0.901 Z						1.49 J					
1,2,3,6,7,8-HxCDF	57117-44-9	pg/L	-	-	-	-	1.28 - 3.57	2							3.57 J			1.28 Z					
1,2,3,7,8,9-HxCDD	19408-74-3	pg/L	-	-	-	-	0.478 - 1.22	4				0.616 Z					0.478 Z	1.22 J				0.929 J	
1,2,3,7,8,9-HxCDF	72918-21-9	pg/L	-	-	-	-	1.34 - 1.34	1										1.34 J					
1,2,3,7,8-PeCDD	40321-76-4	pg/L	-	-	-	-	0.844 - 0.844	1										0.844 Z					
1,2,3,7,8-PeCDF	57117-41-6	pg/L	-	-	-	-	0.948 - 0.948	1										0.948 J					
2,3,4,6,7,8-HxCDF	60851-34-5	pg/L	-	-	-	-	1.35 - 5.65	2							5.65 Z			1.35 Z					
2,3,4,7,8-PeCDF	57117-31-4	pg/L	-	-	-	-	1.04 - 1.04	1										1.04 Z					
2,3,7,8-TCDD	1746-01-6	pg/L	c	0.1	30	0.12	0.449 - 0.449	1					0.449 Z										
2,3,7,8-TCDF	51207-31-9	pg/L	-	-	-	-	0 - 0	0															
OCDD	3268-87-9	pg/L	-	-	-	-	310 - 310	1							310								
OCDF	39001-02-0	pg/L	-	-	-	-	14.9 - 14.9	1							14.9 J								
Total HpCDD	37871-00-4	pg/L	-	-	-	-	9.89 - 79.3	3		9.89 Z					79.3	20.9 Z							
Total HpCDF	38998-75-3	pg/L	-	-	-	-	5.09 - 33	2							33 Z	5.09 Z							
Total HxCDD	34465-46-8	pg/L	-	-	-	-	0.755 - 176	9		3.77 Z	176 Z	1.52 Z			31.9 Z	3.81 Z	1.35 Z	6.26 Z			0.755 Z	1.92 Z	
Total HxCDF	55684-94-1	pg/L	-	-	-	-	6.3 - 50.8	2							50.8 Z			6.3 Z					
Total PeCDD	36088-22-9	pg/L	-	-	-	-	0.844 - 132	3			132				5.37 Z			0.844 Z					
Total PeCDF	30402-15-4	pg/L	-	-	-	-	1.99 - 29.8	2							29.8 J			1.99 Z					
Total TCDD	41903-57-5	pg/L	-	-	-	-	0.449 - 334	8		24.5 Z	334		0.449 Z				2.46 J		10.8 Z	2.43 J	1.18 J	1.91 Z	
Total TCDF	55722-27-5	pg/L	-	-	-	-	23.8 - 23.8	1							23.8								
Total TEQ - Bird	2222-20-0	pg/L	-	-	-	-	1.15 - 31.5	15	1.48	21	3.61	1.33	1.38	1.23	31.5	17.5	1.67	3.4	1.83	1.15	1.57	1.91	1.27
Total TEQ - Fish	2222-21-0	pg/L	-	-	-	-	1.04 - 15.3	15	1.27	14.3	3.56	1.14	1.25	1.07	15.3	12.1	1.38	2.97	1.57	1.04	1.35	1.59	1.07
Total TEQ - Mammal	3333-30-0	pg/L	c	0.1	30	0.12	0 - 2.12	15	0.0577	0.0221	0	0.191	0.449	0	2.12	0.151	0.048	0.965	1.45	0	1.25	1.55	0

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-14a

Anions, Dissolved Gas, and PFCs Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW08		MW13S		MW14S		MW15S		MW16S		MW17S		MW17S-DUP		MW18S		MW24		MW25	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Methane	74-82-8	mg/l	-	-	-	-	0.001	-	88.8	24	0.401		0.123		5.21		2.41		0.689		0.0306		NA				26.6		88.8	
Nitrate	14797-55-8	mg/l	n	3.2	10	3.2	0.15	-	6.78	17											0.617		NA		5.19					
Nitrite	14797-65-0	mg/l	n	0.2	1	0.2	0.5	-	2.5	9													NA							
Sulfate	14808-79-8	mg/l	-	-	-	-	0.765	-	138	28	36.2		57.2		40.8		3.33		4.6		46.6		NA		73.6		14.3		0.765	
Perfluorobutanesulfonic Acid	375-73-5	ug/l	-	-	-	0.2	0	-	0	0																				
Perfluoroheptanoic acid	375-85-9	ug/l	-	-	-	-	0.005	-	0.17	26	0.022		0.032	J	0.049	J	0.021								0.022		0.17		0.13	
Perfluorohexanesulfonic Acid	355-46-4	ug/l	-	-	-	-	0.012	-	0.36	15			0.034	J	0.012	J	0.028	J									0.36		0.34	
Perfluorononanoic Acid	375-95-1	ug/l	-	-	-	-	0.014	-	0.055	16	0.055		0.038	J	0.024	J														
Perfluorooctanesulfonic Acid	1763-23-1	ug/l	-	-	-	0.04	0.015	-	0.42	21	0.42		0.074	J	0.17	J			0.16	J									0.25	J
Perfluorooctanoic Acid	335-67-1	ug/l	-	-	-	0.04	0.012	-	2	29	0.13		0.11	J	2		0.052		0.13	J	0.012	J			0.044		0.13	J		

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-14a

Anions, Dissolved Gas, and PFCs Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW26D		MW26S		MW27		MW28		MW29		MW30		MW31		MW32		MW33		MW35		MW38		MW39	
							Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Methane	74-82-8	mg/l	-	-	-	-	15.5		27.7		0.152		0.046				0.00267		0.00484		0.00141				0.0164		0.269			
Nitrate	14797-55-8	mg/l	n	3.2	10	3.2									3.48		6.78				1.54		5.03		0.15		0.15		2.28	
Nitrite	14797-65-0	mg/l	n	0.2	1	0.2																	0.5		0.5		0.5			
Sulfate	14808-79-8	mg/l	-	-	-	-	1.6				27		32.7		52.4		58.4		138		50.2		69.5		67.6		28.7		91.7	
Perfluorobutanesulfonic Acid	375-73-5	ug/l	-	-	-	0.2																								
Perfluoroheptanoic acid	375-85-9	ug/l	-	-	-	-			0.0078	J	0.013	J	0.039	J	0.016		0.014				0.014		0.021		0.0049	J	0.055		0.014	
Perfluorohexanesulfonic Acid	355-46-4	ug/l	-	-	-	-							0.035	J							0.016	J	0.013	J			0.087	J		
Perfluorononanoic Acid	375-95-1	ug/l	-	-	-	-			0.021				0.016	J	0.018	J	0.014	J			0.017	J	0.016	J	0.048	J				
Perfluorooctanesulfonic Acid	1763-23-1	ug/l	-	-	-	0.04			0.016	J	0.021	J	0.087	J			0.025	J			0.065		0.015	J	0.019	J	0.17	J	0.016	J
Perfluorooctanoic Acid	335-67-1	ug/l	-	-	-	0.04	0.021	J	0.021		0.054	J	0.14	J	0.044		0.048		0.025		0.071		0.047		0.028	J	0.18		0.029	

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality contro

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion
Estimated Maximum Possible Concentration (EMPC) and is considered est

NA -- No result is available/applicable for this parameter in this sample.

Table 4-14a

Anions, Dissolved Gas, and PFCs Detected in Shallow Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW40		MW41D		MW41D-DUP		MW41S		MW42		MW43		MW44		MW46		MW47		MW47-DUP	
							Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Methane	74-82-8	mg/l	-	-	-	-			0.48		NA		4.15		0.00111		0.00621		0.2		0.053		0.00106		NA	
Nitrate	14797-55-8	mg/l	n	3.2	10	3.2	3.91		0.15		NA		0.5		5.2		0.15		1.26		0.15		0.561		NA	
Nitrite	14797-65-0	mg/l	n	0.2	1	0.2	0.5		2.5		NA		1				0.5		0.5		0.5				NA	
Sulfate	14808-79-8	mg/l	-	-	-	-	49.7		11.4		NA		3.46		27		56		62.5		61		68.6		NA	
Perfluorobutanesulfonic Acid	375-73-5	ug/l	-	-	-	0.2																				
Perfluoroheptanoic acid	375-85-9	ug/l	-	-	-	-	0.0069	J	0.093	J	0.091	J			0.014		0.022		0.0099	J	0.038		0.017	J	0.016	J
Perfluorohexanesulfonic Acid	355-46-4	ug/l	-	-	-	-			0.09	J	0.12	J					0.03				0.056		0.02	J	0.018	J
Perfluorononanoic Acid	375-95-1	ug/l	-	-	-	-	0.014	J									0.028		0.02	J	0.027		0.02	J	0.02	J
Perfluorooctanesulfonic Acid	1763-23-1	ug/l	-	-	-	0.04	0.017	J							0.049		0.088		0.02	J	0.11		0.068	J	0.067	J
Perfluorooctanoic Acid	335-67-1	ug/l	-	-	-	0.04	0.021		0.2	J	0.2	J			0.044		0.082		0.037	J	0.13		0.07	J	0.069	J

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality contrc

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion

Estimated Maximum Possible Concentration (EMPC) and is considered est

NA -- No result is available/applicable for this parameter in this sample.

Anions, Dissolved Gas, and PFCs Detected in Shallow Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	Units	RSL*	MCL**	Screening Value	Range			Frequency	MW08		MW13S		MW14S		MW15S		MW16S		MW17S		MW18S		MW24		MW25		MW26D		MW26S		MW27		MW28		MW29	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Nitrate	14797-55-8	n	MG/L	3.2	10	3.2	0.165	-	4.54	15									0.44		1.12		4.2														4.3	
Nitrite	14797-65-0	n	MG/L	0.2	1	0.2	0	-	0	0																												
Sulfate	14808-79-8	-	MG/L	-	-	-	1.51	-	143	27	37.9		39.5		63.2		6.37		9.57		29		62		13.1				1.51				30.4		28.2		49.6	
Acetylene	74-86-2	-	UG/L	-	-	-	55.5	-	2730	14	67.5		55.5		2580		NA		74.4		60.3		55.7		NA		NA		2190		2730		69.8		NA		NA	
Methane	74-82-8	-	UG/L	-	-	-	0.9	-	24000	24	280		17		4400		3600		260		1.1	J	0.9	J	8800		24000		4500		5600		140		12			
Perfluorooctanesulfonic Acid	1763-23-1	-	UG/L	-	-	0.04	0.014	-	0.45	7	0.45		0.04		0.28		0.014	J	0.25		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Perfluorooctanoic Acid	335-67-1	-	UG/L	-	-	0.04	0.031	-	2.7	8	0.15		0.031		2.7		0.074		0.14		NA		NA		NA		NA		NA		NA		NA		NA		NA	

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-14b

Anions, Dissolved Gas, and PFCs Detected in Shallow Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	Units	RSL*	MCL**	Screening Value	MW30		MW31		MW32		MW33		MW35		MW38		MW39		MW40		MW41D		MW41S		MW42		MW43		MW44		MW46		MW47	
							Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Nitrate	14797-55-8	n	MG/L	3.2	10	3.2	3.36		0.43		0.738		4.54						1.07		4.53						2.33		0.165		0.803		0.45		0.282	
Nitrite	14797-65-0	n	MG/L	0.2	1	0.2																														
Sulfate	14808-79-8	-	MG/L	-	-	-	54.2		143		54.4		80.5		64.6		43.6		91.9		43.6		12.8		8.21		34		60.7		52.7		45.3		56.5	
Acetylene	74-86-2	-	UG/L	-	-	-	NA		NA		NA		69.6		NA		NA		NA		NA		62		1140		NA		NA		629		NA		68.1	
Methane	74-82-8	-	UG/L	-	-	-	11		3.8		13				19		140						140		2500				15		1100		11		1.6	
Perfluorooctanesulfonic Acid	1763-23-1	-	UG/L	-	-	0.04	NA		NA		NA		NA		NA		0.14		NA		NA		0.076	J+			NA		NA		NA		NA		NA	
Perfluorooctanoic Acid	335-67-1	-	UG/L	-	-	0.04	NA		NA		NA		NA		NA		0.16		NA		NA		0.23	J+	0.038		NA		NA		NA		NA		NA	

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-14C

Anions and Dissolved Gas Detected in Shallow Groundwater - Outside Landfill Boundary (April 2016)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	Units	RSL*	MCL**	Screening Value	Range			Frequency	MW13S		MW14S		MW15S		MW24		MW25		MW26D		MW26S		MW27		MW41D		MW41S	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Nitrate	14797-55-8	n	MG/L	3.2	10	3.2	0.229	-	0.432	2	0.432		0.229		NA		NA		NA		NA		NA				NA		NA	
Sulfate	14808-79-8	-	MG/L	-	-	-	26.7	-	53.7	3	26.7		53.7		NA		NA		NA		NA		NA		44		NA		NA	
Acetylene	74-86-2	-	UG/L	-	-	-	57.4	-	68.7	8	NA		68.7		59.7		59.2		59.7		58.3		57.4		NA		62.9		59	
Methane	74-82-8	-	UG/L	-	-	-	230	-	15000	8	NA		1200		2800		11000		15000		4000		3200		NA		230		1300	

* USEPA Region III Regional Screening Level (RSL), May 2016

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Inorganics Detected in Deep Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Type	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW13D		MW13I		MW14D		MW15D		MW15D-DUP		MW16D		MW16D-DUP		MW17D		MW18D		MW19		MW21D		MW21S		MW22		MW23D		MW23I		MW23S	
										04/10/14		03/26/14		04/10/14		03/05/14		03/05/14		03/06/14		03/06/14		03/06/14		03/10/14		03/19/14		03/07/14		03/07/14		03/13/14		03/13/14		03/13/14		03/13/14	
										Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Aluminum	Dissolved	7429-90-5	UG/L	n	2000	-	2000	63.3 - 63.3	1	NA		63.3		NA																											
Antimony	Dissolved	7440-36-0	UG/L	n	0.78	6	0.78	0 - 0	0	NA				NA																											
Arsenic	Dissolved	7440-38-2	UG/L	c	0.052	10	0.052	3 - 6.2	2	NA				NA																								6.2		3	
Barium	Dissolved	7440-39-3	UG/L	n	380	2000	380	29.5 - 253	14	NA		47.6		NA		29.5		32.2		32.9		33.8		38		52		253		120		114		49.3		33.7		170		209	
Beryllium	Dissolved	7440-41-7	UG/L	n	2.5	4	2.5	0 - 0	0	NA				NA																											
Boron	Dissolved	7440-42-8	UG/L	n	400	-	400	9 - 88.8	14	NA		41.1	J	NA		9	J	10.6		76		77.9		16.4		20.5		69.9		65.8		67.5		29		88.8		9.5	J	54.9	
Cadmium	Dissolved	7440-43-9	UG/L	n	0.92	5	0.92	0.12 - 0.12	1	NA				NA										0.12	J																
Calcium	Dissolved	7440-70-2	UG/L	-	-	-	-	12500 - 59200	14	NA		53600		NA		12500		14400		17500		17900		19300		19200		59200	J	33300		30300		34000		40200		31500		37500	
Chromium	Dissolved	7440-47-3	UG/L	c	0.035	100	0.035	2 - 4.1	13	NA		3.1	J	NA		4.1	J	2.1	J	3	J	3	J	2.2	J	2.4	J	2.8				2.9	J	3.3	J	2	J	2.7	J	2.3	J
Cobalt	Dissolved	7440-48-4	UG/L	n	0.6	-	0.6	0.38 - 35.7	13	NA		7.6		NA		0.62	J	0.57	J	0.71	J	0.72	J	1.7		0.75	J	0.38	J	29.6		35.7				2		9.3		9.6	
Copper	Dissolved	7440-50-8	UG/L	n	80	1300	80	2.1 - 7.1	7	NA				NA		4.9				2.1		2.1		3.3		3.1		6.7								7.1					
Iron	Dissolved	7439-89-6	UG/L	n	1400	-	1400	603 - 41500	13	NA				NA		4870		5380		982		975		603		1330		13600		6620		4850		2080		3520		36300		41500	
Lead	Dissolved	7439-92-1	UG/L	L	-	15	15	0.18 - 4.6	9	NA				NA		1.7		0.18	J	1.7		1.4		0.27	J	4.6		0.27	J	0.27	J	0.76	J								
Magnesium	Dissolved	7439-95-4	UG/L	-	-	-	-	3100 - 34500	14	NA		34500		NA		3220		3500		3100		3160		19900		4110		22700		15200		15300		5810		3580		14200		14200	
Manganese	Dissolved	7439-96-5	UG/L	n	43	-	43	64.1 - 3780	14	NA		477		NA		136	J	149	J	64.1	J	64.3	J	97.3	J	139	J	1360		3700	J	3780	J	83.5	J	631	J	3660	J	2910	J
Mercury	Dissolved	7439-97-6	UG/L	n	0.063	2	0.063	0 - 0	0	NA				NA																											
Nickel	Dissolved	7440-02-0	UG/L	n	39	-	39	1.5 - 33	14	NA		2.3		NA		7.8		2.5		2.9		2.6		19.1		1.5		5.3		31.4		33		2.3		19.7		19		7.7	
Potassium	Dissolved	7440-09-7	UG/L	-	-	-	-	1750 - 11900	14	NA		9090		NA		3870		4220		3330		3390		6800		11900		8580		8030		8630		5350		3800		1750		3160	
Selenium	Dissolved	7782-49-2	UG/L	n	10	50	10	0.33 - 0.33	1	NA				NA																		0.33	J								
Silver	Dissolved	7440-22-4	UG/L	n	9.4	-	9.4	0 - 0	0	NA				NA																											
Sodium	Dissolved	7440-23-5	UG/L	-	-	-	-	9970 - 2E+05	14	NA		40000		NA		9970		10700		59500		60800		26000		18300		23800		24400		25200		12200		227000		19800		29000	
Thallium	Dissolved	7440-28-0	UG/L	n	0.02	2	0.02	0 - 0	0	NA				NA																											
Vanadium	Dissolved	7440-62-2	UG/L	n	8.6	-	8.6	0 - 0	0	NA				NA																											
Zinc	Dissolved	7440-66-6	UG/L	n	600	-	600	2.4 - 29.8	14	NA		2.4		NA		13.5	J	10	J	14.4	J	10.9	J	19.6	J	6.9	J	29.8	J	17.3	J	22.9	J	6.6	J	7.2	J	29.1	J	10.6	J
Aluminum	Total	7429-90-5	UG/L	n	2000	-	2000	6.1 - 3050	14	3050	J	161		263	J	6.1	J	6.2	J	53.9		53		11.2	J	33.5				7.6	J	7.2	J	37.2	J	35.6	J			20.5	J
Antimony	Total	7440-36-0	UG/L	n	0.78	6	0.78	0 - 0	0																																
Arsenic	Total	7440-38-2	UG/L	c	0.052	10	0.052	0.18 - 7.8	8	1.6		0.18	J	2		0.25	J	0.27	J											0.93	J							7.8		2.8	
Barium	Total	7440-39-3	UG/L	n	380	2000	380	31.8 - 341	16	341		43		40.6		32.6	J	32	J	31.8	J	31.9	J	38.8	J	59.6	J	244		118	J	120	J	49.5		33.2		178		208	
Beryllium	Total	7440-41-7	UG/L	n	2.5	4	2.5	0.15 - 0.15	2																													0.15	J	0.15	J
Boron	Total	7440-42-8	UG/L	n	400	-	400	9.9 - 90.2	16	10.3	J+	41		16	J+	9.9	J	10.7		77.6		74.7		15.5		22.9		80.2		64.6		72.3		27.7		90.2		10.2		51.9	
Cadmium	Total	7440-43-9	UG/L	n	0.92	5	0.92	0.097 - 1.4	3	0.097	J	1.4												0.19	J																
Calcium	Total	7440-70-2	UG/L	-	-	-	-	13400 - 4E+05	16	392000		47000		15500		13500		13400		15300		15500		18400		22100		56200	J	31200		31500		36100	J	36600	J	33900	J	32800	J
Chromium	Total	7440-47-3	UG/L	c	0.035	100	0.035	1.9 - 62.6	12	62.6		3.3		3.3		4.6	J	6.2	J	3	J			2.2	J	2.1	J	36.3	J	1.9	J	3.9	J					5.1	J		
Cobalt	Total	7440-48-4	UG/L	n	0.6	-	0.6	0.073 - 37.7	16	1		6.9		0.073	J	0.64	J	0.56	J	0.67	J	0.64	J	1.6		0.89	J	0.82	J	28.9		37.7		1.4		3.5		10.5		8.7	
Copper	Total	7440-50-8	UG/L	n	80	1300	80	2.1 - 9.1	10	6.3						2.4				3.5				3.6		3.3		5.9		2.1		2.8				9.1		2.2			
Cyanide	Total	57-12-5	UG/L	n	0.15	200	0.15	0.9 - 0.9	1			0.9	J																												
Iron	Total	7439-89-6	UG/L	n	1400	-	1400	234 - 42600	16	1980		234	J	689		5060	J	5140	J	921	J	836	J	328	J	1970	J	13000		6650	J	4980	J	2050	J	4210	J	42600	J	39100	J
Lead	Total	7439-92-1	UG/L	L	-	15	15	0.29 - 4.3	15	4.3				1.1		1.5	J	0.81	J	1.3	J	0.76	J	0.69	J	1.1	J	0.46	J	0.8	J	0.29	J	1.3		0.88	J	0.53	J	0.99	J
Magnesium	Total	7439-95-4	UG/L	-	-	-	-	2220 - 28400	16	2770		28400		2220		3280		3320		2890		2930		19600		4610		22300		14600		15800		6360		3530		16500		14600	
Manganese	Total	7439-96-5	UG/L	n	43	-	43	19.3 - 4090	16	58.4		411		19.3		147		146		64		61.3		97.9		170		1290		3710		4090		64.4	J	538	J	3590	J	2890	J
Mercury	Total	7439-97-6	UG/L	n	0.063	2	0.063	0 - 0	0																																
Nickel	Total	7440-02-0	UG/L	n	39	-	39	1.3 - 34.1	16	23.4		2.4		1.3		6.8		2.6		2.5		1.8		19.4		2.1		30.7	J	27.8		34.1		2.3	J	6.6	J	15.3	J	6.3	J
Potassium	Total	7440-09-7	UG/L	-	-	-	-	1890 - 49900	16	49900		7790		14900		4130		4170		3200		3240		6920		13600		8170		7650		8940		5800		3640		1890		2870	
Selenium	Total	7782-49-2	UG/L	n	10	50	10	0.94 - 1.4	2																					1.4	J	0.94	J								
Silver	Total	7440-22-4	UG/L	n	9.4	-	9.4	0.072 - 0.28	5	0.12	J			0.11	J			0.072	J											0.16	J	0.28	J								
Sodium	Total	7440-23-5	UG/L	-	-	-	-	10300 - 3E+05	16	28500		33400		23500		10400		10300		57100		59200		25600		20300		23400		23500		26400		14200		269000		22400		29400	
Thallium	Total	7440-28-0	UG/L	n	0.02	2	0.02	0 - 0	0																																
Vanadium	Total	7440-62-2	UG/L	n	8.6	-	8.6	8.2 - 8.2	1	8.2	J																														
Zinc	Total	7440-66-6	UG/L	n	600	-	600	4.6 - 48.6	16	30.3		4.6		5.9		10.2	J	8.6	J	17.4	J	12.2	J	14.3	J	48.6	J	32.8		16.3	J	18.8	J	7.7	J	6.3	J	27.2	J	11.4	J

Table 4-15b

Inorganics Detected in Deep Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Type	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW13D	MW13I	MW14D	MW15D	MW15D-DUP	MW16D	MW16D-DUP	MW17D	MW18D	MW19	MW21D	MW21S	MW22	MW23D	MW23I	MW23S
										Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Aluminum	Total	7429-90-5	ug/L	n	2000	-	2000	8.1 - 350	10	237	90.9	295			350 J	81.2 J	8.1 J	25.1	34.6			41.6	212		
Antimony	Total	7440-36-0	ug/L	n	0.78	6	0.78	0 - 0	0																
Arsenic	Total	7440-38-2	ug/L	c	0.052	10	0.052	0.097 - 10	10	0.55	0.52	1.2					0.097 J	0.29 J	0.61			0.98	3.4	10	3.2
Barium	Total	7440-39-3	ug/L	n	380	2000	380	13.2 - 381	16	299	64.5	39.2	33.5	30.6 J	36 J	36.2 J	36.8	59.2	381	87.7 J	131	13.2	62	220	215
Beryllium	Total	7440-41-7	ug/L	n	2.5	4	2.5	0 - 0	0																
Boron	Total	7440-42-8	ug/L	n	400	-	400	5.1 - 108	4								5.1 J-	9.1 J-	108 J+			10 J-			
Cadmium	Total	7440-43-9	ug/L	n	0.92	5	0.92	0.024 - 0.2	2	0.024 J							0.2 J								
Calcium	Total	7440-70-2	ug/L	-	-	-	-	14100 - 298000	12	298000	49700	14800	14100				14400	15800	73900		30400	24000	51600	25800	26400
Chromium	Total	7440-47-3	ug/L	-	0.035	100	0.035	0.17 - 28.7	9	28.7				1.4 J	1.7 J	1.1 J		0.17 J	1 J	1.9 J		0.41 J		0.22 J	
Cobalt	Total	7440-48-4	ug/L	n	0.6	-	0.6	13.8 - 37	2												37		13.8		
Copper	Total	7440-50-8	ug/L	n	80	1300	80	0.41 - 3.4	10	2.6 J		0.64 J		1.8 J	2.2 J	1.8 J	1.6 J	0.59 J		3.1 J	0.41 J	3.4 J			
Cyanide	Total	57-12-5	ug/L	n	0.15	200	0.15	1.6 - 1.6	1					1.6 J-											
Iron	Total	7439-89-6	ug/L	n	1400	-	1400	214 - 68400	13			517	4660	5110	1230	1030		2360	20400	14100	6370	214	11400	68400	51000
Lead	Total	7439-92-1	ug/L	L	-	15	15	0.058 - 1.5	5	1.2		1.5					0.058 J	0.27 J				0.43 J			
Magnesium	Total	7439-95-4	ug/L	-	-	-	-	1650 - 32100	15		23900	1990	3220	3000 J	3130 J	3130 J	15800	3630	32100	11900 J	15600	1650	6990	14200	12500
Manganese	Total	7439-96-5	ug/L	n	43	-	43	3.1 - 4490	14	3.1	163	13.5	146	144			85.6	169	2090	2300	4490	4.1	979	4190	2840
Mercury	Total	7439-97-6	ug/L	n	0.063	2	0.063	0.019 - 0.086	4					0.039 J-					0.019 J-					0.086 J	0.034 J
Nickel	Total	7440-02-0	ug/L	n	39	-	39	0.19 - 27.8	16	4.1	1.1	0.42 J	0.19 J	0.32 J-	0.89 J	0.59 J	14	0.37 J	5	16.8 J	27.8 J	0.78 J	3 J	7.8	4.4
Potassium	Total	7440-09-7	ug/L	-	-	-	-	1470 - 65000	12	65000	10700	28500	4050				5420	8620	11600		8490	6880	3390	1470	2780
Selenium	Total	7782-49-2	ug/L	n	10	50	10	0 - 0	0																
Silver	Total	7440-22-4	ug/L	n	9.4	-	9.4	0 - 0	0																
Sodium	Total	7440-23-5	ug/L	-	-	-	-	5020 - 2E+06	16	38300	45000	38600	9760	2200000	2240000	2380000	21200	14200	32100	2140000	24200	5020	57600	18400	26100
Thallium	Total	7440-28-0	ug/L	n	0.02	2	0.02	0 - 0	0																
Vanadium	Total	7440-62-2	ug/L	n	8.6	-	8.6	0.22 - 1.7	5		0.73 J-	1.7 J			0.96 J				0.22 J					0.34 J	
Zinc	Total	7440-66-6	ug/L	n	600	-	600	2.3 - 162	11	10.3 J		3.8 J			162		8.6 J	6.3 J	5.9		12.9 J	4.6 J	4.2 J	20	2.3
Aluminum	Dissolved	7429-90-5	ug/L	n	2000	-	2000	4 - 71.3	5	71.3	67.6						11.5 J	4 J				8.2 J			
Antimony	Dissolved	7440-36-0	ug/L	n	0.78	6	0.78	0 - 0	0																
Arsenic	Dissolved	7440-38-2	ug/L	c	0.052	10	0.052	0.16 - 5.2	12	0.62	0.44 J	1.1	0.21 J				0.16 J	0.37 J	1		0.26 J	0.9	3.2	5.2	3.2
Barium	Dissolved	7440-39-3	ug/L	n	380	2000	380	13.3 - 561	12	315	57.9	31	29.5				38.8	60.1	561		117	13.3	50.6	188	202
Beryllium	Dissolved	7440-41-7	ug/L	n	2.5	4	2.5	0 - 0	0																
Cadmium	Dissolved	7440-43-9	ug/L	n	0.92	5	0.92	0.23 - 0.23	1								0.23 J								
Calcium	Dissolved	7440-70-2	ug/L	-	-	-	-	11400 - 292000	16	292000	48400	11400	12300	15600	14400	16500	15000	15900	104000	33300	28400	24900	50600	26300	25900
Chromium	Dissolved	7440-47-3	ug/L	-	0.035	100	0.035	0.28 - 0.36	2		0.28 J											0.36 J			
Cobalt	Dissolved	7440-48-4	ug/L	n	0.6	-	0.6	0.041 - 37.2	8	0.7 J							0.94 J	0.041 J			37.2	0.077 J	13.7	3.9 J	4.1 J
Copper	Dissolved	7440-50-8	ug/L	n	80	1300	80	0.15 - 2.9	6	1.7 J	0.2 J-	0.15 J	0.23 J								0.3 J	2.9			
Iron	Dissolved	7439-89-6	ug/L	n	1400	-	1400	288 - 36600	11				4220	5990	288	443		1930 J	26100 J	15700	5600		9700	34900 J	36600 J
Lead	Dissolved	7439-92-1	ug/L	L	-	15	15	0.02 - 0.87	3	0.87 J							0.02 J					0.15 J			
Magnesium	Dissolved	7439-95-4	ug/L	-	-	-	-	1780 - 45900	14		24700		2660	3300 J	2280 J	2620 J	16200	3630	45900	12700	15300	1780	6580	14500	12200
Manganese	Dissolved	7439-96-5	ug/L	n	43	-	43	0.082 - 4800	15	0.082 J	130		138	169	50.6	63	96.4	170	3100	2520	4800	0.54 J	959	4070	2690
Mercury	Dissolved	7439-97-6	ug/L	n	0.063	2	0.063	0.016 - 0.076	10			0.023 J	0.032 J	0.076 J	0.016 J-				0.021 J	0.025 J-	0.022 J		0.022 J	0.029 J	0.033 J
Nickel	Dissolved	7440-02-0	ug/L	n	39	-	39	0.22 - 28.5	11	3.6	1.2 J		0.51 J				14.8	0.22 J	7 J		28.5	0.8 J	3.3	8 J	4.6 J
Potassium	Dissolved	7440-09-7	ug/L	-	-	-	-	1490 - 66000	13	66000	10900	26000	3610				5620	8650	16200 J	6800	7760	6900	3270	1490 J	2730 J
Selenium	Dissolved	7782-49-2	ug/L	n	10	50	10	0 - 0	0																
Silver	Dissolved	7440-22-4	ug/L	n	9.4	-	9.4	0 - 0	0																
Sodium	Dissolved	7440-23-5	ug/L	-	-	-	-	5170 - 83800	16	37700	49200	37900	9300	10600	83800	72700	20900	13800	46100	20300	24200	5170	58500	18400	25400
Thallium	Dissolved	7440-28-0	ug/L	n	0.02	2	0.02	0 - 0	0																
Vanadium	Dissolved	7440-62-2	ug/L	n	8.6	-	8.6	0.24 - 1.6	5		0.91 J	1.6 J					0.39 J	0.24 J				0.67 J			
Zinc	Dissolved	7440-66-6	ug/L	n	600	-	600	2.3 - 14.1	10	4.3 J	2.3	3.9					7.4 J		5.2 J		14.1	2.4 J	7.9	13.4 J	4.1 J

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-15c

Inorganics Detected in Deep Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	Fraction	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW13D		MW13I		MW14D		MW15D		MW16D		MW17D		MW18D		MW19		MW21D		MW21S		MW22		MW23D		MW23I		MW23S	
												Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Aluminum	Total	7429-90-5	n	2000	-	2000	UG/L	3.8	-	36800	11	135	J	183	J	84.4		NA		244	J	10.6	J	227		24.9						63.6		36800	J	4.3	J	3.8	J
Antimony	Total	7440-36-0	n	0.78	6	0.78	UG/L	5.5	-	5.5	1	5.5						NA																					
Arsenic	Total	7440-38-2	c	0.052	10	0.052	UG/L	0.13	-	5.5	13	0.28	J	0.36	J	0.78		NA		0.69	J	0.13		0.28		0.39		1.1		0.28		1.4		5.5	J	5		2.9	
Barium	Total	7440-39-3	n	380	2000	380	UG/L	30.8	-	363	13	363	J	68.2	J	31.4	J	NA		30.8	J	36.8		61.6		319		126	J	127	J	34.8	J	180	J	202		223	
Beryllium	Total	7440-41-7	n	2.5	4	2.5	UG/L	0.11	-	2.5	4							NA								0.17	J							2.5	J-	0.11	J	0.13	J
Cadmium	Total	7440-43-9	n	0.92	5	0.92	UG/L	0.016	-	0.2	6	0.028	J					NA				0.19	J					0.017	J	0.02	J	0.016	J	0.2	J				
Calcium	Total	7440-70-2	-	-	-	-	UG/L	4940	-	314000	13	314000	J	51600	J	4940	J	NA		13800	J	18200		17600		66600		32700	J	30000	J	30900	J	103000	J	28400		30300	
Chromium	Total	7440-47-3	c	0.035	100	0.035	UG/L	0.046	-	27.1	7	25.7	J					NA				0.046	J	0.52	J	0.4	J							27.1	J	0.12	J	0.11	J
Cobalt	Total	7440-48-4	n	0.6	-	0.6	UG/L	0.026	-	40.9	10					0.026	J	NA				0.79	J	0.09	J	0.26	J	29.9		40.9		0.69	J	29.9	J	4.2		4.4	
Copper	Total	7440-50-8	n	80	1300	80	UG/L	0.82	-	10.9	4	3.2						NA				2		0.82	J									10.9					
Cyanide	Total	57-12-5	n	0.15	200	0.15	UG/L	11.1	-	11.1	1	NA		NA				NA		11.1	J	NA		NA		NA		NA		NA		NA							
Iron	Total	7439-89-6	n	1400	-	1400	UG/L	70.2	-	42500	11					213	J	NA		896	J	70.2	J	2920	J	21600		11600	J	7430	J	2450	J	30700	J	42500		42400	
Lead	Total	7439-92-1	L	-	15	15	UG/L	0.033	-	41.4	9	1.7		0.048	J			NA		0.84	J	0.058	J	1.1		0.21	J							41.4		0.033	J	0.045	J
Magnesium	Total	7439-95-4	-	-	-	-	UG/L	394	-	28700	12			26700	J	394	J	NA		2530	J	17100		3860		28700		14400	J	15100	J	1960	J	15100	J	14900	J	13600	J
Manganese	Total	7439-96-5	n	43	-	43	UG/L	1.1	-	5080	12	1.1	J	253	J			NA		58.5	J	85.8		175		1610		4070		5080		225		1430	J	3590		2790	
Mercury	Total	7439-97-6	n	0.063	2	0.063	UG/L	0.016	-	0.06	5							NA						0.018	J	0.06	J			0.016	J					0.041	J	0.042	J
Nickel	Total	7440-02-0	n	39	-	39	UG/L	0.16	-	27.3	11	1.3	J			0.2	J	NA				16.5		0.16	J-	3.6		22.3	J	27.3	J	0.61	J	22.5	J	6.4		4.1	
Potassium	Total	7440-09-7	-	-	-	-	UG/L	1770	-	71500	13	71500		12300		38900	J	NA		3480		6300		9020		9390		7130	J	7540	J	4990	J	4670		1770		2970	
Selenium	Total	7782-49-2	n	10	50	10	UG/L	0.22	-	0.26	2							NA						0.26	J	0.22	J												
Silver	Total	7440-22-4	n	9.4	-	9.4	UG/L	0.032	-	0.032	1							NA																0.032	J				
Sodium	Total	7440-23-5	-	-	-	-	UG/L	10300	-	73700	13	43800		46300		44500	J	NA		73700		25000		13500		27500		22600	J	26200	J	10300	J	61000	J-	21300	J	26700	
Thallium	Total	7440-28-0	n	0.02	2	0.02	UG/L	0	-	0	0							NA																					
Vanadium	Total	7440-62-2	n	8.6	-	8.6	UG/L	0.03	-	15.4	6					1.3	J	NA				0.37	J	0.67	J			0.03	J			2.2	J	15.4					
Zinc	Total	7440-66-6	n	600	-	600	UG/L	2	-	67.8	13	5.8	J+	2	J+	3.7		NA		39.7	J+	10.6		15.7		4.5		12.8		13.4		4.3		67.8	J+	11.9		4.1	
Aluminum	Dissolved	7429-90-5	n	2000	-	2000	UG/L	1.3	-	112	14	112		95		6	J	1.3		5	J	11.3	J	3.9	J	1.8	J	3.9	J	7	J	28.4		2.7	J	2.2	J	2.8	J
Antimony	Dissolved	7440-36-0	n	0.78	6	0.78	UG/L	0.15	-	5.3	4	5.3		0.15	J			2														2							
Arsenic	Dissolved	7440-38-2	c	0.052	10	0.052	UG/L	0.12	-	4	14	0.23		0.29		0.82		0.17		0.49		0.12		0.19		0.37		1.1		0.27		1.2		2.3		4		2.7	
Barium	Dissolved	7440-39-3	n	380	2000	380	UG/L	29.9	-	351	14	351		68		29.9		33.8		30		37.7		60.4		308		125		127		36.2		54		194		224	
Beryllium	Dissolved	7440-41-7	n	2.5	4	2.5	UG/L	0.078	-	1	5							1								0.14	J					1				0.078	J	0.12	J
Cadmium	Dissolved	7440-43-9	n	0.92	5	0.92	UG/L	0.016	-	0.17	3											0.17	J					0.016	J	0.026	J								
Calcium	Dissolved	7440-70-2	-	-	-	-	UG/L	5350	-	305000	14	305000		52700		5350		13700		14100		16700		17400		65900		32400		30800		30900		55500		28400		28900	
Chromium	Dissolved	7440-47-3	c	0.035	100	0.035	UG/L	0.041	-	25.3	14	25.3		0.18	J	1.1	J	0.041		0.07	J	0.059	J	0.1	J	0.23	J	0.062	J	0.064	J	0.47		0.15	J	0.089	J	0.099	J
Cobalt	Dissolved	7440-48-4	n	0.6	-	0.6	UG/L	0.061	-	40.5	11	0.061	J	0.18	J			1				0.9	J			0.24	J	29.4		40.5		0.59		18.1		4.1		4.3	
Copper	Dissolved	7440-50-8	n	80	1300	80	UG/L	0.17	-	2.4	3	2.4						0.2														0.17							
Iron	Dissolved	7439-89-6	n	1400	-	1400	UG/L	9.8	-	41100	14	9.8	J	25.8	J	11	J	5080		470		102	J	2540		18800		10800		7770		2190		13100		39400		41100	
Lead	Dissolved	7439-92-1	L	-	15	15	UG/L	0.026	-	1.6	11	1.6		0.044	J	0.04	J	1		0.026	J	0.067	J	0.038	J	0.034	J	0.028	J	0.027	J	0.037							
Magnesium	Dissolved	7439-95-4	-	-	-	-	UG/L	16.4	-	29900	14	16.4	J	25300		53.1	J	3160		2500		16700		3800		29900		13700		14500		2170		6900		14800		13200	
Manganese	Dissolved	7439-96-5	n	43	-	43	UG/L	0.076	-	4630	13			248		0.076	J-	146		51.1		90.2		176		1610		3700		4630		226		801		3760		2820	
Mercury	Dissolved	7439-97-6	n	0.063	2	0.063	UG/L	0.015	-	0.035	10	0.021	J	0.015	J	0.033	J+	0.019				0.015	J+					0.03	J+	0.023	J+	0.035		0.026	J			0.019	J
Nickel	Dissolved	7440-02-0	n	39	-	39	UG/L	0.097	-	26.8	12	1		0.86	J			0.1		0.097	J	16				3.5		22		26.8		0.38		2.3		6.2		4	
Potassium	Dissolved	7440-09-7	-	-	-	-	UG/L	1740	-	74700	14	74700		10800		36300		3960		3650		6290		8950		9220		7550		7970		4840		3240		1740		2940	
Selenium	Dissolved	7782-49-2	n	10	50	10	UG/L	5	-	5	2							5														5							
Silver	Dissolved	7440-22-4	n	9.4	-	9.4	UG/L	1	-	1	2							1														1							
Sodium	Dissolved	7440-23-5	-	-	-	-	UG/L	10000	-	75400	13	45600	J	47000	J	42400		10000		75400	J	23400		20500	J	27600		20700				10600		69200	J	20100		27800	
Thallium	Dissolved	7440-28-0	n	0.02	2	0.02	UG/L	0	-	0	0																												
Vanadium	Dissolved	7440-62-2	n	8.6	-	8.6	UG/L	0.044	-	2.6	6					1.2	J	2.6				0.28	J	0.18	J	0.044	J-					2.6							
Zinc	Dissolved	7440-66-6	n	600	-	600	UG/L	0.59	-	14.1	14	3.7	J	0.98	J	1.9	J	2.3		0.59	J	11.4	J	2.1	J	2.3	J	12.1	J	14.1	J	1.2		1.4	J	11	J	3.4	J

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-16a

Volatile Organic Compounds (VOCs) Detected in Deep Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW13D		MW13I		MW14D		MW15D		MW15D-DUP		MW16D		MW16D-DUP		MW17D		MW18D		MW19		MW21D		MW21S		MW22	
											04/10/14		03/26/14		04/10/14		03/05/14		03/05/14		03/06/14		03/06/14		03/06/14		03/10/14		03/19/14		03/07/14		03/07/14		03/13/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1,1-Trichloroethane	71-55-6	UG/L	n	800	200	200	0	-	0	0																										
1,1,2,2-Tetrachloroethane	79-34-5	UG/L	c	0.076	-	0.076	0	-	0	0																										
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	UG/L	n	5500	-	5500	0	-	0	0																										
1,1,2-Trichloroethane	79-00-5	UG/L	c	0.28	5	0.28	0	-	0	0																										
1,1-Dichloroethane	75-34-3	UG/L	c	2.8	-	2.8	2.4	-	2.4	1																			2.4	J						
1,1-Dichloroethene	75-35-4	UG/L	n	28	7	7	0	-	0	0																										
1,2,3-Trichlorobenzene	87-61-6	UG/L	n	0.7	-	0.7	0	-	0	0																										
1,2,4-Trichlorobenzene	120-82-1	UG/L	c	0.4	70	0.4	0	-	0	0																										
1,2-Dibromo-3-chloropropane	96-12-8	UG/L	c	0.00033	0.2	0.00033	0	-	0	0																										
1,2-Dibromoethane	106-93-4	UG/L	c	0.0075	0.05	0.0075	0	-	0	0																										
1,2-Dichlorobenzene	95-50-1	UG/L	n	30	600	30	0	-	0	0																										
1,2-Dichloroethane	107-06-2	UG/L	c	0.17	5	0.17	0	-	0	0																										
1,2-Dichloropropane	78-87-5	UG/L	c	0.44	5	0.44	0	-	0	0																										
1,3-Dichlorobenzene	541-73-1	UG/L	-	-	-	-	0	-	0	0																										
1,4-Dichlorobenzene	106-46-7	UG/L	c	0.48	75	0.48	0	-	0	0																										
2-Butanone	78-93-3	UG/L	n	560	-	560	0	-	0	0																										
2-Hexanone	591-78-6	UG/L	n	3.8	-	3.8	0	-	0	0																										
4-Methyl-2-pentanone	108-10-1	UG/L	n	630	-	630	0	-	0	0																										
Acetone	67-64-1	UG/L	n	1400	-	1400	0	-	0	0																										
Benzene	71-43-2	UG/L	c	0.46	5	0.46	0	-	0	0																										
Bromochloromethane	74-97-5	UG/L	n	8.3	-	8.3	0	-	0	0																										
Bromodichloromethane	75-27-4	UG/L	c	0.13	80	0.13	0	-	0	0																										
Bromoform	75-25-2	UG/L	c	3.3	80	3.3	0	-	0	0																										
Bromomethane	74-83-9	UG/L	n	0.75	-	0.75	0	-	0	0																										
Carbon disulfide	75-15-0	UG/L	n	81	-	81	0	-	0	0																										
Carbon tetrachloride	56-23-5	UG/L	c	0.46	5	0.46	0	-	0	0																										
Chlorobenzene	108-90-7	UG/L	n	7.8	100	7.8	0.28	-	0.28	1																										
Chloroethane	75-00-3	UG/L	n	2100	-	2100	0	-	0	0																										
Chloroform	67-66-3	UG/L	c	0.22	80	0.22	0	-	0	0																										
Chloromethane	74-87-3	UG/L	n	19	-	19	0	-	0	0																										
cis-1,2-Dichloroethene	156-59-2	UG/L	n	3.6	70	3.6	0.21	-	1000	4	100		68																1000							
cis-1,3-Dichloropropene	10061-01-5	UG/L	-	0.47	-	0.47	0	-	0	0																										
Cyclohexane	110-82-7	UG/L	n	1300	-	1300	0	-	0	0																										
Dibromochloromethane	124-48-1	UG/L	c	0.87	80	0.87	0	-	0	0																										
Dichlorodifluoromethane	75-71-8	UG/L	n	20	-	20	0	-	0	0																										
Ethylbenzene	100-41-4	UG/L	c	1.5	700	1.5	0	-	0	0																										
Isopropylbenzene	98-82-8	UG/L	n	45	-	45	0	-	0	0																										
m,p-Xylene	179601-23-1	UG/L	-	19	-	19	0	-	0	0																										
Methyl acetate	79-20-9	UG/L	n	2000	-	2000	0	-	0	0																										
Methyl tert-butyl ether	1634-04-4	UG/L	c	14	-	14	0.39	-	0.41	2																										
Methylcyclohexane	108-87-2	UG/L	-	-	-	-	0	-	0	0																										
Methylene chloride	75-09-2	UG/L	c	11	5	5	0	-	0	0																										
o-Xylene	95-47-6	UG/L	n	19		19	0	-	0	0																										
Styrene	100-42-5	UG/L	n	120	100	100	0	-	0	0																										
Tetrachloroethene	127-18-4	UG/L	c	4.1	5	4.1	0.45	-	0.45	1			0.45	J																						
Toluene	108-88-3	UG/L	n	110	1000	110	0.13	-	1.5	5	0.32	J			0.13	J	1.1	J	1.5	J	1.4	J														
trans-1,2-Dichloroethene	156-60-5	UG/L	n	36	100	36	0.34	-	2.6	2			0.34	J															2.6	J						
trans-1,3-Dichloropropene	10061-02-6	UG/L	-	0.47	-	0.47	0	-	0	0																										
Trichloroethene	79-01-6	UG/L	c	0.28	5	0.28	0.25	-	260	4	2.5		44																260						0.25	J
Trichlorofluoromethane	75-69-4	UG/L	n	520	-	520	0	-	0	0																										
Vinyl chloride	75-01-4	UG/L	c	0.019	2	0.019	0	-	0	0																										

Table 4-16a

Volatile Organic Compounds (VOCs) Detected in Deep Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW23D		MW23I		MW23S	
											03/13/14		03/13/14		03/13/14	
											Result	Flag	Result	Flag	Result	Flag
1,1,1-Trichloroethane	71-55-6	UG/L	n	800	200	200	0	-	0	0						
1,1,2,2-Tetrachloroethane	79-34-5	UG/L	c	0.076	-	0.076	0	-	0	0						
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	UG/L	n	5500	-	5500	0	-	0	0						
1,1,2-Trichloroethane	79-00-5	UG/L	c	0.28	5	0.28	0	-	0	0						
1,1-Dichloroethane	75-34-3	UG/L	c	2.8	-	2.8	2.4	-	2.4	1						
1,1-Dichloroethene	75-35-4	UG/L	n	28	7	7	0	-	0	0						
1,2,3-Trichlorobenzene	87-61-6	UG/L	n	0.7	-	0.7	0	-	0	0						
1,2,4-Trichlorobenzene	120-82-1	UG/L	c	0.4	70	0.4	0	-	0	0						
1,2-Dibromo-3-chloropropane	96-12-8	UG/L	c	0.00033	0.2	0.00033	0	-	0	0						
1,2-Dibromoethane	106-93-4	UG/L	c	0.0075	0.05	0.0075	0	-	0	0						
1,2-Dichlorobenzene	95-50-1	UG/L	n	30	600	30	0	-	0	0						
1,2-Dichloroethane	107-06-2	UG/L	c	0.17	5	0.17	0	-	0	0						
1,2-Dichloropropane	78-87-5	UG/L	c	0.44	5	0.44	0	-	0	0						
1,3-Dichlorobenzene	541-73-1	UG/L	-	-	-	-	0	-	0	0						
1,4-Dichlorobenzene	106-46-7	UG/L	c	0.48	75	0.48	0	-	0	0						
2-Butanone	78-93-3	UG/L	n	560	-	560	0	-	0	0						
2-Hexanone	591-78-6	UG/L	n	3.8	-	3.8	0	-	0	0						
4-Methyl-2-pentanone	108-10-1	UG/L	n	630	-	630	0	-	0	0						
Acetone	67-64-1	UG/L	n	1400	-	1400	0	-	0	0						
Benzene	71-43-2	UG/L	c	0.46	5	0.46	0	-	0	0						
Bromochloromethane	74-97-5	UG/L	n	8.3	-	8.3	0	-	0	0						
Bromodichloromethane	75-27-4	UG/L	c	0.13	80	0.13	0	-	0	0						
Bromoform	75-25-2	UG/L	c	3.3	80	3.3	0	-	0	0						
Bromomethane	74-83-9	UG/L	n	0.75	-	0.75	0	-	0	0						
Carbon disulfide	75-15-0	UG/L	n	81	-	81	0	-	0	0						
Carbon tetrachloride	56-23-5	UG/L	c	0.46	5	0.46	0	-	0	0						
Chlorobenzene	108-90-7	UG/L	n	7.8	100	7.8	0.28	-	0.28	1					0.28	J
Chloroethane	75-00-3	UG/L	n	2100	-	2100	0	-	0	0						
Chloroform	67-66-3	UG/L	c	0.22	80	0.22	0	-	0	0						
Chloromethane	74-87-3	UG/L	n	19	-	19	0	-	0	0						
cis-1,2-Dichloroethene	156-59-2	UG/L	n	3.6	70	3.6	0.21	-	1000	4					0.21	J
cis-1,3-Dichloropropene	10061-01-5	UG/L	-	0.47	-	0.47	0	-	0	0						
Cyclohexane	110-82-7	UG/L	n	1300	-	1300	0	-	0	0						
Dibromochloromethane	124-48-1	UG/L	c	0.87	80	0.87	0	-	0	0						
Dichlorodifluoromethane	75-71-8	UG/L	n	20	-	20	0	-	0	0						
Ethylbenzene	100-41-4	UG/L	c	1.5	700	1.5	0	-	0	0						
Isopropylbenzene	98-82-8	UG/L	n	45	-	45	0	-	0	0						
m,p-Xylene	179601-23-1	UG/L	-	19	-	19	0	-	0	0						
Methyl acetate	79-20-9	UG/L	n	2000	-	2000	0	-	0	0						
Methyl tert-butyl ether	1634-04-4	UG/L	c	14	-	14	0.39	-	0.41	2			0.39	J	0.41	J
Methylcyclohexane	108-87-2	UG/L	-	-	-	-	0	-	0	0						
Methylene chloride	75-09-2	UG/L	c	11	5	5	0	-	0	0						
o-Xylene	95-47-6	UG/L	n	19		19	0	-	0	0						
Styrene	100-42-5	UG/L	n	120	100	100	0	-	0	0						
Tetrachloroethene	127-18-4	UG/L	c	4.1	5	4.1	0.45	-	0.45	1						
Toluene	108-88-3	UG/L	n	110	1000	110	0.13	-	1.5	5						
trans-1,2-Dichloroethene	156-60-5	UG/L	n	36	100	36	0.34	-	2.6	2						
trans-1,3-Dichloropropene	10061-02-6	UG/L	-	0.47	-	0.47	0	-	0	0						
Trichloroethene	79-01-6	UG/L	c	0.28	5	0.28	0.25	-	260	4						
Trichlorofluoromethane	75-69-4	UG/L	n	520	-	520	0	-	0	0						
Vinyl chloride	75-01-4	UG/L	c	0.019	2	0.019	0	-	0	0						

Table 4-16b

Volatile Organic Compounds (VOCs) Detected in Deep Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW13D	MW13I	MW14D	MW15D	MW15D-DUP	MW16D	MW16D-DUP	MW17D	MW18D	MW19	MW21D	MW21S	MW22	MW23D	MW23I	MW23S
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,1,1-Trichloroethane	71-55-6	ug/L	n	800	200	200	0 - 0	0																
1,1,2,2-Tetrachloroethane	79-34-5	ug/L	c	0.076	-	0.076	0 - 0	0																
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ug/L	n	5500	-	5500	0 - 0	0																
1,1,2-Trichloroethane	79-00-5	ug/L	c	0.28	5	0.28	0 - 0	0																
1,1-Dichloroethane	75-34-3	ug/L	c	2.8	-	2.8	0.31 - 3.7	3	0.35 J	0.31 J								3.7 J						
1,1-Dichloroethene	75-35-4	ug/L	n	28	7	7	0.27 - 7.3	3	0.27 J	0.88								7.3						
1,2,3-Trichlorobenzene	87-61-6	ug/L	n	0.7	-	0.7	0 - 0	0																
1,2,4-Trichlorobenzene	120-82-1	ug/L	n	0.4	70	0.4	0 - 0	0																
1,2-Dibromo-3-chloropropane	96-12-8	ug/L	c	0.00033	0.2	0.00033	0 - 0	0																
1,2-Dibromoethane	106-93-4	ug/L	c	0.0075	0.05	0.0075	0 - 0	0																
1,2-Dichlorobenzene	95-50-1	ug/L	n	30	600	30	0 - 0	0																
1,2-Dichloroethane	107-06-2	ug/L	c	0.17	5	0.17	0 - 0	0																
1,2-Dichloropropane	78-87-5	ug/L	c	0.44	5	0.44	0 - 0	0																
1,3-Dichlorobenzene	541-73-1	ug/L	-	-	-	-	0 - 0	0																
1,4-Dichlorobenzene	106-46-7	ug/L	c	0.48	75	0.48	0.2 - 0.23	2								0.23 J				0.2 J				
2-Butanone	78-93-3	ug/L	n	560	-	560	3 - 4.3	2	4.3 J													3 J		
2-Hexanone	591-78-6	ug/L	n	3.8	-	3.8	0 - 0	0																
4-Methyl-2-pentanone	108-10-1	ug/L	n	630	-	630	0 - 0	0																
Acetone	67-64-1	ug/L	n	1400	-	1400	1.5 - 4.6	6			1.5 J			4.2 J	4.6 J				1.7 J	1.8 J		3.1 J		
Benzene	71-43-2	ug/L	c	0.46	5	0.46	0.089 - 0.88	5	0.17 J	0.26 J								0.88 J	0.089 J	0.11 J				
Bromochloromethane	74-97-5	ug/L	n	8.3	-	8.3	0 - 0	0																
Bromodichloromethane	75-27-4	ug/L	c	0.13	80	0.13	0 - 0	0																
Bromoform	75-25-2	ug/L	c	3.3	80	3.3	0 - 0	0																
Bromomethane	74-83-9	ug/L	n	0.75	-	0.75	0 - 0	0																
Carbon disulfide	75-15-0	ug/L	n	81	-	81	0.16 - 0.72	5						0.33 J	0.2 J			0.72 J				0.16 J	0.17 J	
Carbon tetrachloride	56-23-5	ug/L	c	0.46	5	0.46	0 - 0	0																
Chlorobenzene	108-90-7	ug/L	n	7.8	100	7.8	0.077 - 2.8	8	0.088 J	0.35 J						0.28 J		2.8 J	0.4 J	0.69 J			0.077 J	0.34 J
Chloroethane	75-00-3	ug/L	n	2100	-	2100	0 - 0	0																
Chloroform	67-66-3	ug/L	c	0.22	80	0.22	0 - 0	0																
Chloromethane	74-87-3	ug/L	n	19	-	19	0.15 - 0.2	2	0.2 J		0.15 J													
cis-1,2-Dichloroethene	156-59-2	ug/L	n	3.6	70	3.6	0.22 - 1800	6	120	85								1800	1.8	2				0.22 J
cis-1,3-Dichloropropene	10061-01-5	ug/L	c	0.47	-	0.47	0 - 0	0																
Cyclohexane	110-82-7	ug/L	n	1300	-	1300	0 - 0	0																
Dibromochloromethane	124-48-1	ug/L	c	0.87	80	0.87	0 - 0	0																
Dichlorodifluoromethane	75-71-8	ug/L	n	20	-	20	0 - 0	0																
Ethylbenzene	100-41-4	ug/L	c	1.5	700	1.5	0 - 0	0																
Isopropylbenzene	98-82-8	ug/L	n	45	-	45	0 - 0	0																
m,p-Xylene	179601-23-1	ug/L	n	19	-	19	0.24 - 0.24	1	0.24 J															
Methyl acetate	79-20-9	ug/L	n	2000	-	2000	0 - 0	0																
Methyl tert-Butyl Ether	1634-04-4	ug/L	c	14	-	14	0.35 - 0.97	6	0.35 J	0.97						0.6				0.36 J			0.51	0.47 J
Methylcyclohexane	108-87-2	ug/L	-	-	-	-	0 - 0	0																
Methylene chloride	75-09-2	ug/L	c	11	5	5	0 - 0	0																
o-Xylene	95-47-6	ug/L	n	19		19	0.2 - 0.2	1	0.2 J															
Styrene	100-42-5	ug/L	n	120	100	100	0 - 0	0																
Tetrachloroethene	127-18-4	ug/L	n	4.1	5	4.1	0.38 - 0.38	1		0.38 J														
Toluene	108-88-3	ug/L	n	110	1000	110	3.1 - 3.1	1	3.1															
trans-1,2-Dichloroethene	156-60-5	ug/L	n	36	100	36	0.17 - 5.7	3	0.17 J	0.36 J								5.7						
trans-1,3-Dichloropropene	10061-02-6	ug/L	c	0.47	-	0.47	0 - 0	0																
Trichloroethene	79-01-6	ug/L	n	0.28	5	0.28	0.15 - 420	6	5.9	53								420	0.15 J	0.15 J				0.2 J
Trichlorofluoromethane	75-69-4	ug/L	n	520	-	520	0 - 0	0																
Vinyl chloride	75-01-4	ug/L	c	0.019	2	0.019	0.51 - 11	3	0.69	0.51 J								11						

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL)

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample

Table 4-16c

Volatile Organic Compounds (VOCs) Detected in Deep Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW13D		MW13I		MW14D		MW15D		MW16D		MW19		MW21D		MW21S		MW22	
											Result		Result		Result		Result		Result		Result		Result		Result		Result	
1,1,1-Trichloroethane	71-55-6	n	800	200	200	UG/L	0	-	0	0																		
1,1,2,2-Tetrachloroethane	79-34-5	c	0.076	-	0.076	UG/L	0	-	0	0																		
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	n	5500	-	5500	UG/L	0	-	0	0																		
1,1,2-Trichloroethane	79-00-5	c	0.28	5	0.28	UG/L	0	-	0	0																		
1,1-Dichloroethane	75-34-3	c	2.8	-	2.8	UG/L	0.22	-	2.9	3	0.23	J	0.22	J							2.9	J+						
1,1-Dichloroethene	75-35-4	n	28	7	7	UG/L	0.27	-	4.7	3	0.27	J	0.81								4.7	J+						
1,2,3-Trichlorobenzene	87-61-6	n	0.7	-	0.7	UG/L	0	-	0	0																		
1,2,4-Trichlorobenzene	120-82-1	n	0.4	70	0.4	UG/L	0	-	0	0																		
1,2-Dibromo-3-chloropropane	96-12-8	c	0.00033	0.2	0.00033	UG/L	0	-	0	0																		
1,2-Dibromoethane(EDB)	106-93-4	c	0.0075	0.05	0.0075	UG/L	0	-	0	0																		
1,2-Dichlorobenzene	95-50-1	n	30	600	30	UG/L	0	-	0	0																		
1,2-Dichloroethane	107-06-2	c	0.17	5	0.17	UG/L	0	-	0	0																		
1,2-Dichloropropane	78-87-5	c	0.44	5	0.44	UG/L	0	-	0	0																		
1,3-Dichlorobenzene	541-73-1	-	-	-	-	UG/L	0	-	0	0																		
1,4-Dichlorobenzene	106-46-7	c	0.48	75	0.48	UG/L	0	-	0	0																		
2-Butanone	78-93-3	n	560	-	560	UG/L	0	-	0	0																		
2-Hexanone	591-78-6	n	3.8	-	3.8	UG/L	0	-	0	0																		
4-Methyl-2-pentanone	108-10-1	n	630	-	630	UG/L	0	-	0	0																		
Acetone	67-64-1	n	1400	-	1400	UG/L	6.4	-	18	2	18																6.4	
Benzene	71-43-2	c	0.46	5	0.46	UG/L	0.23	-	0.65	2			0.23	J							0.65	J+						
Bromochloromethane	74-97-5	n	8.3	-	8.3	UG/L	0	-	0	0																		
Bromodichloromethane	75-27-4	c	0.13	80	0.13	UG/L	0	-	0	0																		
Bromoform	75-25-2	c	3.3	80	3.3	UG/L	0	-	0	0																		
Bromomethane	74-83-9	n	0.75	-	0.75	UG/L	0	-	0	0																		
Carbon disulfide	75-15-0	n	81	-	81	UG/L	0.31	-	0.51	2											0.31	J+					0.51	J-
Carbon tetrachloride	56-23-5	c	0.46	5	0.46	UG/L	0	-	0	0																		
Chlorobenzene	108-90-7	n	7.8	100	7.8	UG/L	0.34	-	3.2	4			0.34	J							3.2	J+	0.59		0.57			
Chloroethane	75-00-3	n	2100	-	2100	UG/L	0	-	0	0																		
Chloroform	67-66-3	c	0.22	80	0.22	UG/L	1.2	-	1.2	1																	1.2	
Chloromethane	74-87-3	n	19	-	19	UG/L	0	-	0	0																		
cis-1,2-Dichloroethene	156-59-2	n	3.6	70	3.6	UG/L	1.7	-	1500	5	100		84								1500		1.7		1.8			
cis-1,3-Dichloropropene	10061-01-5	c	0.47	-	0.47	UG/L	0	-	0	0																		
Cyclohexane	110-82-7	n	1300	-	1300	UG/L	0	-	0	0																		
Dibromochloromethane	124-48-1	c	0.87	80	0.87	UG/L	0	-	0	0																		
Dichlorodifluoromethane	75-71-8	n	20	-	20	UG/L	0	-	0	0																		
Ethylbenzene	100-41-4	c	1.5	700	1.5	UG/L	0	-	0	0																		
Isopropylbenzene (Cumene)	98-82-8	n	45	-	45	UG/L	0	-	0	0																		
m,p-Xylene	179601-23-1	n	19	-	19	UG/L	0	-	0	0																		
Methyl Acetate	79-20-9	n	2000	-	2000	UG/L	0	-	0	0																		
Methyl tert-butyl ether	1634-04-4	c	14	-	14	UG/L	0.27	-	1.3	5	0.27	J	0.71								1.3	J+	0.35	J	0.38	J		
Methylcyclohexane	108-87-2	-	-	-	-	UG/L	0	-	0	0																		
Methylene chloride	75-09-2	c	11	5	5	UG/L	0	-	0	0																		
o-Xylene	95-47-6	n	19		19	UG/L	0	-	0	0																		
Styrene	100-42-5	n	120	100	100	UG/L	0	-	0	0																		
Tetrachloroethene	127-18-4	n	4.1	5	4.1	UG/L	0.31	-	0.31	1			0.31	J														
Toluene	108-88-3	n	110	1000	110	UG/L	0.55	-	1.6	2	0.55				1.6													
trans-1,2-Dichloroethene	156-60-5	n	36	100	36	UG/L	6.3	-	6.3	1											6.3	J+						
trans-1,3-Dichloropropene	10061-02-6	c	0.47	-	0.47	UG/L	0	-	0	0																		
Trichloroethene	79-01-6	n	0.28	5	0.28	UG/L	3.5	-	330	3	3.5		59								330							
Trichlorofluoromethane	75-69-4	n	520	-	520	UG/L	0	-	0	0																		
Vinyl chloride	75-01-4	c	0.019	2	0.019	UG/L	8.5	-	8.5	1											8.5	J+						

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-16d

Volatile Organic Compounds (VOCs) Detected in Deep Groundwater - Outside Landfill Boundary (April 2016)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW13D Result		MW13I Result		MW19 Result		MW21D Result		MW21S Result	
1,1,1-Trichloroethane	71-55-6	n	800	200	200	UG/L	0	-	0	0										
1,1,2,2-Tetrachloroethane	79-34-5	c	0.076	-	0.076	UG/L	0	-	0	0										
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	n	5500	-	5500	UG/L	0	-	0	0										
1,1,2-Trichloroethane	79-00-5	c	0.28	5	0.28	UG/L	0	-	0	0										
1,1-Dichloroethane	75-34-3	c	2.8	-	2.8	UG/L	0.28	-	3.6	3	0.37	J	0.28	J	3.6					
1,1-Dichloroethene	75-35-4	n	28	7	7	UG/L	4.6	-	4.6	1					4.6					
1,2,3-Trichlorobenzene	87-61-6	n	0.7	-	0.7	UG/L	0	-	0	0										
1,2,4-Trichlorobenzene	120-82-1	n	0.4	70	0.4	UG/L	0	-	0	0										
1,2-Dibromo-3-chloropropane	96-12-8	c	0.00033	0.2	0.00033	UG/L	0	-	0	0										
1,2-Dibromoethane(EDB)	106-93-4	c	0.0075	0.05	0.0075	UG/L	0	-	0	0										
1,2-Dichlorobenzene	95-50-1	n	30	600	30	UG/L	0.13	-	0.17	2							0.13	J	0.17	J
1,2-Dichloroethane	107-06-2	c	0.17	5	0.17	UG/L	0	-	0	0										
1,2-Dichloropropane	78-87-5	c	0.44	5	0.44	UG/L	0	-	0	0										
1,3-Dichlorobenzene	541-73-1	-	-	-	-	UG/L	0	-	0	0										
1,4-Dichlorobenzene	106-46-7	c	0.48	75	0.48	UG/L	0.17	-	0.2	2							0.17	J	0.2	J
2-Butanone	78-93-3	n	560	-	560	UG/L	0	-	0	0										
2-Hexanone	591-78-6	n	3.8	-	3.8	UG/L	0	-	0	0										
4-Methyl-2-pentanone	108-10-1	n	630	-	630	UG/L	0	-	0	0										
Acetone	67-64-1	n	1400	-	1400	UG/L	5.2	-	27	3	27		5.2		12.45					
Benzene	71-43-2	c	0.46	5	0.46	UG/L	0.745	-	0.75	1					0.745					
Bromochloromethane	74-97-5	n	8.3	-	8.3	UG/L	0	-	0	0										
Bromodichloromethane	75-27-4	c	0.13	80	0.13	UG/L	0	-	0	0										
Bromoform	75-25-2	c	3.3	80	3.3	UG/L	0	-	0	0										
Bromomethane	74-83-9	n	0.75	-	0.75	UG/L	0	-	0	0										
Carbon disulfide	75-15-0	n	81	-	81	UG/L	0	-	0	0										
Carbon tetrachloride	56-23-5	c	0.46	5	0.46	UG/L	0	-	0	0										
Chlorobenzene	108-90-7	n	7.8	100	7.8	UG/L	0.37	-	4.4	4			0.37	J	4.4		0.6		0.76	
Chloroethane	75-00-3	n	2100	-	2100	UG/L	0	-	0	0										
Chloroform	67-66-3	c	0.22	80	0.22	UG/L	0	-	0	0										
Chloromethane	74-87-3	n	19	-	19	UG/L	0.16	-	0.16	1	0.16	J								
cis-1,2-Dichloroethene	156-59-2	n	3.6	70	3.6	UG/L	2.4	-	1750	5	120		74	J-	1750		2.4		2.4	
cis-1,3-Dichloropropene	10061-01-5	c	0.47	-	0.47	UG/L	0	-	0	0										
Cyclohexane	110-82-7	n	1300	-	1300	UG/L	0.21	-	0.21	1					0.21	J				
Dibromochloromethane	124-48-1	c	0.87	80	0.87	UG/L	0	-	0	0										
Dichlorodifluoromethane	75-71-8	n	20	-	20	UG/L	0	-	0	0										
Ethylbenzene	100-41-4	c	1.5	700	1.5	UG/L	0	-	0	0										
Isopropylbenzene (Cumene)	98-82-8	n	45	-	45	UG/L	0	-	0	0										
m,p-Xylene	179601-23-1	n	19	-	19	UG/L	0.11	-	0.11	1	0.11	J								
Methyl Acetate	79-20-9	n	2000	-	2000	UG/L	0	-	0	0										
Methyl tert-butyl ether	1634-04-4	c	14	-	14	UG/L	0.29	-	2.35	5	0.39	J	1.1		2.35		0.29	J	0.44	J
Methylcyclohexane	108-87-2	-	-	-	-	UG/L	0	-	0	0										
Methylene chloride	75-09-2	c	11	5	5	UG/L	0	-	0	0										
o-Xylene	95-47-6	n	19		19	UG/L	0	-	0	0										
Styrene	100-42-5	n	120	100	100	UG/L	0	-	0	0										
Tetrachloroethene	127-18-4	n	4.1	5	4.1	UG/L	0.17	-	0.17	1			0.17	J						
Toluene	108-88-3	n	110	1000	110	UG/L	0.1	-	0.31	2	0.31	J			0.1	J				
trans-1,2-Dichloroethene	156-60-5	n	36	100	36	UG/L	0.13	-	6.7	3	0.13	J	0.26	J	6.7					
trans-1,3-Dichloropropene	10061-02-6	c	0.47	-	0.47	UG/L	0	-	0	0										
Trichloroethene	79-01-6	n	0.28	5	0.28	UG/L	0.13	-	295	5	3.7		44		295		0.15	J	0.13	J
Trichlorofluoromethane	75-69-4	n	520	-	520	UG/L	0	-	0	0										
Vinyl chloride	75-01-4	c	0.019	2	0.019	UG/L	0.38	-	9.7	3	0.92		0.38	J	9.7					

* USEPA Region III Regional Screening Level (RSL), May 2016

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-17a

Semivolatile Organic Compounds (SVOCs) Detected in Deep Groundwater - Outside Landfill Boundary (March 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW13D		MW13I		MW14D		MW15D		MW15D-DUP		MW16D		MW16D-DUP		MW17D		MW18D		MW19		MW21D		MW21S		MW22		MW23D		MW23I		MW23S	
									04/10/14		03/26/14		04/10/14		03/05/14		03/05/14		03/06/14		03/06/14		03/06/14		03/10/14		03/19/14		03/07/14		03/07/14		03/13/14		03/13/14		03/13/14		03/13/14	
									Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,1'-Biphenyl	92-52-4	UG/L	n	0.083	-	0.083	0 - 0	0																																
1,2,4,5-Tetrachlorobenzene	95-94-3	UG/L	n	0.17	-	0.17	0 - 0	0																																
1,4-Dioxane	123-91-1	UG/L	c	0.46	-	0.46	6.2 - 22	3	7.3		6.2																22													
2,2'-Oxybis(1-chloropropane)	108-60-1	UG/L	n	71	-	71	0 - 0	0																																
2,3,4,6-Tetrachlorophenol	58-90-2	UG/L	n	24	-	24	0 - 0	0																																
2,4,5-Trichlorophenol	95-95-4	UG/L	n	120	-	120	0 - 0	0																																
2,4,6-Trichlorophenol	88-06-2	UG/L	n	1.2	-	1.2	0 - 0	0																																
2,4-Dichlorophenol	120-83-2	UG/L	n	4.6	-	4.6	0 - 0	0																																
2,4-Dimethylphenol	105-67-9	UG/L	n	36	-	36	0 - 0	0																																
2,4-Dinitrophenol	51-28-5	UG/L	n	3.9	-	3.9	0 - 0	0																																
2,4-Dinitrotoluene	121-14-2	UG/L	c	0.24	-	0.24	0 - 0	0																																
2,6-Dinitrotoluene	606-20-2	UG/L	c	0.049	-	0.049	0 - 0	0																																
2-Chloronaphthalene	91-58-7	UG/L	n	75	-	75	0 - 0	0																																
2-Chlorophenol	95-57-8	UG/L	n	9.1	-	9.1	0 - 0	0																																
2-Methylnaphthalene	91-57-6	UG/L	n	3.6	-	3.6	0 - 0	0																																
2-Methylphenol	95-48-7	UG/L	n	93	-	93	0 - 0	0																																
2-Nitroaniline	88-74-4	UG/L	n	19	-	19	0 - 0	0																																
2-Nitrophenol	88-75-5	UG/L	-	-	-	-	0 - 0	0																																
3,3'-Dichlorobenzidine	91-94-1	UG/L	c	0.13	-	0.13	0 - 0	0																																
3-Nitroaniline	99-09-2	UG/L	-	-	-	-	0 - 0	0																																
4,6-Dinitro-2-methylphenol	534-52-1	UG/L	n	0.15	-	0.15	0 - 0	0																																
4-Bromophenyl-phenylether	101-55-3	UG/L	-	-	-	-	0 - 0	0																																
4-Chloro-3-methylphenol	59-50-7	UG/L	n	140	-	140	0 - 0	0																																
4-Chloroaniline	106-47-8	UG/L	c	0.37	-	0.37	0 - 0	0																																
4-Chlorophenyl-phenylether	7005-72-3	UG/L	-	-	-	-	0 - 0	0																																
4-Methylphenol	106-44-5	UG/L	n	190	-	190	0 - 0	0																																
4-Nitroaniline	100-01-6	UG/L	c	3.8	-	3.8	0 - 0	0																																
4-Nitrophenol	100-02-7	UG/L	-	-	-	-	0 - 0	0																																
Acenaphthene	83-32-9	UG/L	n	53	-	53	0 - 0	0																																
Acenaphthylene	208-96-8	UG/L	-	-	-	-	0 - 0	0																																
Acetophenone	98-86-2	UG/L	n	190	-	190	0 - 0	0																																
Anthracene	120-12-7	UG/L	n	180	-	180	0 - 0	0																																
Atrazine	1912-24-9	UG/L	c	0.3	3	0.3	0 - 0	0																																
Benzaldehyde	100-52-7	UG/L	n	190	-	190	0 - 0	0																																
Benzo(a)anthracene	56-55-3	UG/L	c	0.012	-	0.012	0 - 0	0																																
Benzo(a)pyrene	50-32-8	UG/L	c	0.0034	0.2	0.0034	0 - 0	0																																
Benzo(b)fluoranthene	205-99-2	UG/L	c	0.034	-	0.034	0 - 0	0																																
Benzo(g,h,i)perylene	191-24-2	UG/L	-	-	-	-	0 - 0	0																																
Benzo(k)fluoranthene	207-08-9	UG/L	c	0.34	-	0.34	0 - 0	0																																
Bis(2-chloroethoxy)methane	111-91-1	UG/L	n	5.9	-	5.9	0 - 0	0																																
Bis(2-chloroethyl)ether	111-44-4	UG/L	c	0.014	-	0.014	0 - 0	0																																
Bis(2-ethylhexyl)phthalate	117-81-7	UG/L	c	5.6	6	5.6	2.8 - 7	3	7		2.8	J	3.7	J																										
Butylbenzylphthalate	85-68-7	UG/L	c	16	-	16	0 - 0	0																																
Caprolactam	105-60-2	UG/L	n	990	-	990	0 - 0	0																																
Carbazole	86-74-8	UG/L	-	-	-	-	2.8 - 2.8	1									2.8	J																						
Chrysene	218-01-9	UG/L	c	3.4	-	3.4	0 - 0	0																																
Dibenzo(a,h)anthracene	53-70-3	UG/L	c	0.0034	-	0.0034	0 - 0	0																																
Dibenzofuran	132-64-9	UG/L	n	0.79	-	0.79	0 - 0	0																																
Diethylphthalate	84-66-2	UG/L	n	1500	-	1500	3.5 - 20	2							20																								3.5	J
Dimethylphthalate	131-11-3	UG/L	-	-	-	-	0 - 0	0																																
Di-n-butylphthalate	84-74-2	UG/L	n	90	-	90	0 - 0	0																																
Di-n-octylphthalate	117-84-0	UG/L	n	20	-	20	0 - 0	0																																
Fluoranthene	206-44-0	UG/L	n	80	-	80	0 - 0	0																																

Table 4-17a
Semivolatile Organic Compounds (SVOCs) Detected in Deep Groundwater - Outside Landfill Boundary (March 2014)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW13D		MW13I		MW14D		MW15D		MW15D-DUP		MW16D		MW16D-DUP		MW17D		MW18D		MW19		MW21D		MW21S		MW22		MW23D		MW23I		MW23S	
											04/10/14		03/26/14		04/10/14		03/05/14		03/05/14		03/06/14		03/06/14		03/06/14		03/10/14		03/19/14		03/07/14		03/07/14		03/13/14		03/13/14		03/13/14		03/13/14	
											Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Fluorene	86-73-7	UG/L	n	29	-	29	0	-	0	0																																
Hexachlorobenzene	118-74-1	UG/L	c	0.0098	1	0.0098	0	-	0	0																																
Hexachlorobutadiene	87-68-3	UG/L	c	0.14	-	0.14	0	-	0	0																																
Hexachlorocyclopentadiene	77-47-4	UG/L	n	0.041	50	0.041	0	-	0	0																																
Hexachloroethane	67-72-1	UG/L	c	0.33	-	0.33	0	-	0	0																																
Indeno(1,2,3-cd)pyrene	193-39-5	UG/L	c	0.034	-	0.034	0	-	0	0																																
Isophorone	78-59-1	UG/L	c	78	-	78	0	-	0	0																																
Naphthalene	91-20-3	UG/L	c	0.17	-	0.17	0	-	0	0																																
Nitrobenzene	98-95-3	UG/L	c	0.14	-	0.14	0	-	0	0																																
N-Nitroso-di-n-propylamine	621-64-7	UG/L	c	0.011	-	0.011	0	-	0	0																																
N-Nitrosodiphenylamine	86-30-6	UG/L	c	12	-	12	0	-	0	0																																
Pentachlorophenol	87-86-5	UG/L	c	0.041	1	0.041	0	-	0	0																																
Phenanthrene	85-01-8	UG/L	-	-	-	-	0	-	0	0																																
Phenol	108-95-2	UG/L	n	580	-	580	0	-	0	0																																
Pyrene	129-00-0	UG/L	n	12	-	12	0	-	0	0																																

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW-13D 12/22/2014 Result		MW-13I 12/22/2014 Result		MW-14D 12/17/2014 Result		MW-15D 12/15/2014 Result		MW-15D-DUP 12/15/2014 Result		MW-16D 12/12/2014 Result		MW-16D-DUP 12/15/2014 Result		MW-17D 12/29/2014 Result		MW-18D 12/29/2014 Result		MW-19 12/4/2014 Result	
1,1'-Biphenyl	92-52-4	UG/L	n	0.083	-	0.083	0 - 0	0																				
1,2,4,5-Tetrachlorobenzene	95-94-3	UG/L	n	0.17	-	0.17	0 - 0	0																				
2,2'-Oxybis(1-chloropropane)	108-60-1	UG/L	n	71	-	71	0 - 0	0																				
2,3,4,6-Tetrachlorophenol	58-90-2	UG/L	n	24	-	24	0 - 0	0																				
2,4,5-Trichlorophenol	95-95-4	UG/L	n	120	-	120	0 - 0	0																				
2,4,6-Trichlorophenol	88-06-2	UG/L	n	1.2	-	1.2	0 - 0	0																				
2,4-Dichlorophenol	120-83-2	UG/L	n	4.6	-	4.6	0 - 0	0																				
2,4-Dimethylphenol	105-67-9	UG/L	n	36	-	36	0 - 0	0																				
2,4-Dinitrophenol	51-28-5	UG/L	n	3.9	-	3.9	0 - 0	0																				
2,4-Dinitrotoluene	121-14-2	UG/L	c	0.24	-	0.24	0 - 0	0																				
2,6-Dinitrotoluene	606-20-2	UG/L	c	0.049	-	0.049	0 - 0	0																				
2-Chloronaphthalene	91-58-7	UG/L	n	75	-	75	0 - 0	0																				
2-Chlorophenol	95-57-8	UG/L	n	9.1	-	9.1	0 - 0	0																				
2-Methylnaphthalene	91-57-6	UG/L	n	3.6	-	3.6	0.45 - 0.45	1	0.45	J																		
2-Methylphenol	95-48-7	UG/L	n	93	-	93	0 - 0	0																				
2-Nitroaniline	88-74-4	UG/L	n	19	-	19	0 - 0	0																				
2-Nitrophenol	88-75-5	UG/L	-	-	-	-	0 - 0	0																				
3,3'-Dichlorobenzidine	91-94-1	UG/L	c	0.13	-	0.13	0 - 0	0																				
3-Nitroaniline	99-09-2	UG/L	-	-	-	-	0 - 0	0																				
4,6-Dinitro-2-methylphenol	534-52-1	UG/L	n	0.15	-	0.15	0 - 0	0																				
4-Bromophenyl-phenylether	101-55-3	UG/L	-	-	-	-	0 - 0	0																				
4-Chloro-3-methylphenol	59-50-7	UG/L	n	140	-	140	0 - 0	0																				
4-Chloroaniline	106-47-8	UG/L	c	0.37	-	0.37	0 - 0	0																				
4-Chlorophenyl-phenylether	7005-72-3	UG/L	-	-	-	-	0 - 0	0																				
4-Methylphenol	106-44-5	UG/L	n	190	-	190	0 - 0	0																				
4-Nitroaniline	100-01-6	UG/L	c	3.8	-	3.8	0 - 0	0																				
4-Nitrophenol	100-02-7	UG/L	-	-	-	-	0 - 0	0																				
Acenaphthene	83-32-9	UG/L	n	53	-	53	1.7 - 1.7	1	1.7	J																		
Acenaphthylene	208-96-8	UG/L	-	-	-	-	0 - 0	0																				
Acetophenone	98-86-2	UG/L	n	190	-	190	0 - 0	0																				
Anthracene	120-12-7	UG/L	n	180	-	180	0.91 - 0.91	1	0.91	J																		
Atrazine	1912-24-9	UG/L	c	0.3	3		0 - 0	0																				
Benzaldehyde	100-52-7	UG/L	n	190	-	190	0.62 - 0.62	1	0.62	J																		
Benzo(a)anthracene	56-55-3	UG/L	c	0.012	-		0 - 0	0																				
Benzo(a)pyrene	50-32-8	UG/L	c	0.0034	0.2		0 - 0	0																				
Benzo(b)fluoranthene	205-99-2	UG/L	c	0.034	-		0 - 0	0																				
Benzo(g,h,i)perylene	191-24-2	UG/L	-	-	-	-	0.45 - 0.45	1											0.45	J								
Benzo(k)fluoranthene	207-08-9	UG/L	c	0.34	-		0 - 0	0																				
Bis(2-chloroethoxy)methane	111-91-1	UG/L	n	5.9	-		0 - 0	0																				
Bis(2-chloroethyl)ether	111-44-4	UG/L	c	0.014	-	0.014	0 - 0	0																				
Bis(2-ethylhexyl)phthalate	117-81-7	UG/L	c	5.6	6	5.6	0.5 - 4.9	2	4.9	J							0.5	J										
Butylbenzylphthalate	85-68-7	UG/L	c	16	-		0 - 0	0																				
Caprolactam	105-60-2	UG/L	n	990	-		0 - 0	0																				
Carbazole	86-74-8	UG/L	-	-	-		0 - 0	0																				
Chrysene	218-01-9	UG/L	c	3.4	-		0 - 0	0																				
Dibenzo(a,h)anthracene	53-70-3	UG/L	c	0.0034	-	0.0034	0.32 - 0.32	1											0.32	J								
Dibenzofuran	132-64-9	UG/L	n	0.79	-	0.79	0 - 0	0																				
Diethylphthalate	84-66-2	UG/L	n	1500	-		0 - 0	0																				
Dimethylphthalate	131-11-3	UG/L	-	-	-		0 - 0	0																				

Semivolatile Organic Compounds (SVOCs) Detected in Deep Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW-13D 12/22/2014		MW-13I 12/22/2014		MW-14D 12/17/2014		MW-15D 12/15/2014		MW-15D-DUP 12/15/2014		MW-16D 12/12/2014		MW-16D-DUP 12/15/2014		MW-17D 12/29/2014		MW-18D 12/29/2014		MW-19 12/4/2014	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Di-n-butylphthalate	84-74-2	UG/L	n	90	-		0	-	0	0																				
Di-n-octylphthalate	117-84-0	UG/L	n	20	-		0	-	0	0																				
Fluoranthene	206-44-0	UG/L	n	80	-	80	0.77	-	0.77	1	0.77	J																		
Fluorene	86-73-7	UG/L	n	29	-	29	1.4	-	1.4	1	1.4	J																		
Hexachlorobenzene	118-74-1	UG/L	c	0.0098	1		0	-	0	0																				
Hexachlorobutadiene	87-68-3	UG/L	c	0.14	-		0	-	0	0																				
Hexachlorocyclopentadiene	77-47-4	UG/L	n	0.041	50		0	-	0	0																				
Hexachloroethane	67-72-1	UG/L	c	0.33	-		0	-	0	0																				
Indeno(1,2,3-cd)pyrene	193-39-5	UG/L	c	0.034	-	0.034	0.39	-	0.39	1											0.39	J								
Isophorone	78-59-1	UG/L	c	78	-	0.17	0	-	0	0																				
Naphthalene	91-20-3	UG/L	c	0.17	-	0.17	0.36	-	0.36	1	0.36	J																		
Nitrobenzene	98-95-3	UG/L	c	0.14	-		0	-	0	0																				
N-Nitroso-di-n-propylamine	621-64-7	UG/L	c	0.011	-		0	-	0	0																				
N-Nitrosodiphenylamine	86-30-6	UG/L	c	12	-	12	0.99	-	0.99	1	0.99	J																		
Pentachlorophenol	87-86-5	UG/L	c	0.041	1		0	-	0	0																				
Phenanthrene	85-01-8	UG/L	-	-	-	-	2.5	-	2.5	1	2.5	J																		
Phenol	108-95-2	UG/L	n	580	-	580	0	-	0	0																				
Pyrene	129-00-0	UG/L	n	12	-	12	0.65	-	0.65	1	0.65	J																		

Data Qualifiers:

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

Semivolatile Organic Compounds (SVOCs) Detected in Deep Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW-21D 12/16/2014 Result		MW-21S 12/17/2014 Result		MW-22 12/30/2014 Result		MW-23D 12/17/2014 Result		MW-23I 12/10/2014 Result		MW-23S 12/10/2014 Result	
1,1'-Biphenyl	92-52-4	UG/L	n	0.083	-	0.083												
1,2,4,5-Tetrachlorobenzene	95-94-3	UG/L	n	0.17	-	0.17												
2,2'-Oxybis(1-chloropropane)	108-60-1	UG/L	n	71	-	71												
2,3,4,6-Tetrachlorophenol	58-90-2	UG/L	n	24	-	24												
2,4,5-Trichlorophenol	95-95-4	UG/L	n	120	-	120												
2,4,6-Trichlorophenol	88-06-2	UG/L	n	1.2	-	1.2												
2,4-Dichlorophenol	120-83-2	UG/L	n	4.6	-	4.6												
2,4-Dimethylphenol	105-67-9	UG/L	n	36	-	36												
2,4-Dinitrophenol	51-28-5	UG/L	n	3.9	-	3.9												
2,4-Dinitrotoluene	121-14-2	UG/L	c	0.24	-	0.24												
2,6-Dinitrotoluene	606-20-2	UG/L	c	0.049	-	0.049												
2-Chloronaphthalene	91-58-7	UG/L	n	75	-	75												
2-Chlorophenol	95-57-8	UG/L	n	9.1	-	9.1												
2-Methylnaphthalene	91-57-6	UG/L	n	3.6	-	3.6												
2-Methylphenol	95-48-7	UG/L	n	93	-	93												
2-Nitroaniline	88-74-4	UG/L	n	19	-	19												
2-Nitrophenol	88-75-5	UG/L	-	-	-	-												
3,3'-Dichlorobenzidine	91-94-1	UG/L	c	0.13	-	0.13												
3-Nitroaniline	99-09-2	UG/L	-	-	-	-												
4,6-Dinitro-2-methylphenol	534-52-1	UG/L	n	0.15	-	0.15												
4-Bromophenyl-phenylether	101-55-3	UG/L	-	-	-	-												
4-Chloro-3-methylphenol	59-50-7	UG/L	n	140	-	140												
4-Chloroaniline	106-47-8	UG/L	c	0.37	-	0.37												
4-Chlorophenyl-phenylether	7005-72-3	UG/L	-	-	-	-												
4-Methylphenol	106-44-5	UG/L	n	190	-	190												
4-Nitroaniline	100-01-6	UG/L	c	3.8	-	3.8												
4-Nitrophenol	100-02-7	UG/L	-	-	-	-												
Acenaphthene	83-32-9	UG/L	n	53	-	53												
Acenaphthylene	208-96-8	UG/L	-	-	-	-												
Acetophenone	98-86-2	UG/L	n	190	-	190												
Anthracene	120-12-7	UG/L	n	180	-	180												
Atrazine	1912-24-9	UG/L	c	0.3	3													
Benzaldehyde	100-52-7	UG/L	n	190	-	190												
Benzo(a)anthracene	56-55-3	UG/L	c	0.012	-													
Benzo(a)pyrene	50-32-8	UG/L	c	0.0034	0.2													
Benzo(b)fluoranthene	205-99-2	UG/L	c	0.034	-													
Benzo(g,h,i)perylene	191-24-2	UG/L	-	-	-	-												
Benzo(k)fluoranthene	207-08-9	UG/L	c	0.34	-													
Bis(2-chloroethoxy)methane	111-91-1	UG/L	n	5.9	-													
Bis(2-chloroethyl)ether	111-44-4	UG/L	c	0.014	-	0.014												
Bis(2-ethylhexyl)phthalate	117-81-7	UG/L	c	5.6	6	5.6												
Butylbenzylphthalate	85-68-7	UG/L	c	16	-													
Caprolactam	105-60-2	UG/L	n	990	-													
Carbazole	86-74-8	UG/L	-	-	-													
Chrysene	218-01-9	UG/L	c	3.4	-													
Dibenzo(a,h)anthracene	53-70-3	UG/L	c	0.0034	-	0.0034												
Dibenzofuran	132-64-9	UG/L	n	0.79	-	0.79												
Diethylphthalate	84-66-2	UG/L	n	1500	-													
Dimethylphthalate	131-11-3	UG/L	-	-	-													

Table 4-17b

Semivolatile Organic Compounds (SVOCs) Detected in Deep Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	MW-21D 12/16/2014		MW-21S 12/17/2014		MW-22 12/30/2014		MW-23D 12/17/2014		MW-23I 12/10/2014		MW-23S 12/10/2014	
							Result		Result		Result		Result		Result		Result	
Di-n-butylphthalate	84-74-2	UG/L	n	90	-													
Di-n-octylphthalate	117-84-0	UG/L	n	20	-													
Fluoranthene	206-44-0	UG/L	n	80	-	80												
Fluorene	86-73-7	UG/L	n	29	-	29												
Hexachlorobenzene	118-74-1	UG/L	c	0.0098	1													
Hexachlorobutadiene	87-68-3	UG/L	c	0.14	-													
Hexachlorocyclopentadiene	77-47-4	UG/L	n	0.041	50													
Hexachloroethane	67-72-1	UG/L	c	0.33	-													
Indeno(1,2,3-cd)pyrene	193-39-5	UG/L	c	0.034	-	0.034												
Isophorone	78-59-1	UG/L	c	78	-	0.17												
Naphthalene	91-20-3	UG/L	c	0.17	-	0.17												
Nitrobenzene	98-95-3	UG/L	c	0.14	-													
N-Nitroso-di-n-propylamine	621-64-7	UG/L	c	0.011	-													
N-Nitrosodiphenylamine	86-30-6	UG/L	c	12	-	12												
Pentachlorophenol	87-86-5	UG/L	c	0.041	1													
Phenanthrene	85-01-8	UG/L	-	-	-	-												
Phenol	108-95-2	UG/L	n	580	-	580												
Pyrene	129-00-0	UG/L	n	12	-	12												

Data Qualifiers:

J -- Value is considered estimated due to exceedance of technical quality control crit

Table 4-17c

1,4 Dioxane and Polycyclic Aromatic Hydrocarbons (PAHs) Detected in Deep Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW13D		MW13I		MW14D		MW15D		MW15D-DUP		MW16D		MW16D-DUP		MW17D		MW18D	
											Result		Result		Result		Result		Result		Result		Result		Result		Result	
1,4-Dioxane	123-91-1	ug/L	c	0.46	-	0.46	0.044	-	29	10	6.2		14				0.086	J			0.12	J	0.044	J				
2-Methylnaphthalene	91-57-6	ug/L	n	3.6	-	3.6	0.006	-	0.032	2	0.032	J	0.0061	J														
Acenaphthene	83-32-9	ug/L	n	53	-	53	0.009	-	0.0086	1															0.0086	J		
Acenaphthylene	208-96-8	ug/L	-	-	-	-	0	-	0	0																		
Anthracene	120-12-7	ug/L	n	180	-	180	0.007	-	0.0066	1									0.0066	J								
Benzo(a)anthracene	56-55-3	ug/L	c	0.012	-	0.012	0	-	0	0																		
Benzo(a)pyrene	50-32-8	ug/L	c	0.0034	0.2	0.0034	0	-	0	0																		
Benzo(b)fluoranthene	205-99-2	ug/L	c	0.034	-	0.034	0	-	0	0																		
Benzo(g,h,i)perylene	191-24-2	ug/L	-	-	-	-	0.007	-	0.0073	1																		
Benzo(k)fluoranthene	207-08-9	ug/L	c	0.34	-	0.34	0	-	0	0																		
Chrysene	218-01-9	ug/L	c	3.4	-	3.4	0	-	0	0																		
Dibenzo(a,h)anthracene	53-70-3	ug/L	c	0.0034	-	0.0034	0.006	-	0.0057	1																		
Fluoranthene	206-44-0	ug/L	n	80	-	80	0	-	0	0																		
Fluorene	86-73-7	ug/L	n	29	-	29	0	-	0	0																		
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	c	0.034	-	0.034	0.006	-	0.006	1																		
Naphthalene	91-20-3	ug/L	c	0.17	-	0.17	0.006	-	0.045	8	0.045	J	0.0097	J			0.011	J			0.015	J	0.019	J	0.0063	J	0.0081	J
Pentachlorophenol	87-86-5	ug/L	c	0.041	1	0.041	0	-	0	0	NA		NA		NA										NA		NA	
Phenanthrene	85-01-8	ug/L	-	-	-	-	0.008	-	0.011	2																		
Pyrene	129-00-0	ug/L	n	12	-	12	0	-	0	0																		

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-17c

1,4 Dioxane and Polycyclic Aromatic Hydrocarbons (PAHs) Detected in Deep Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW19		MW21D		MW21S		MW22		MW23D		MW23I		MW23S	
											Result		Result		Result		Result		Result		Result		Result	
1,4-Dioxane	123-91-1	ug/L	c	0.46	-	0.46	0.044	-	29	10	29		1.2		1.1						0.16	J	0.2	J
2-Methylnaphthalene	91-57-6	ug/L	n	3.6	-	3.6	0.006	-	0.032	2														
Acenaphthene	83-32-9	ug/L	n	53	-	53	0.009	-	0.0086	1														
Acenaphthylene	208-96-8	ug/L	-	-	-	-	0	-	0	0														
Anthracene	120-12-7	ug/L	n	180	-	180	0.007	-	0.0066	1														
Benzo(a)anthracene	56-55-3	ug/L	c	0.012	-	0.012	0	-	0	0														
Benzo(a)pyrene	50-32-8	ug/L	c	0.0034	0.2	0.0034	0	-	0	0														
Benzo(b)fluoranthene	205-99-2	ug/L	c	0.034	-	0.034	0	-	0	0														
Benzo(g,h,i)perylene	191-24-2	ug/L	-	-	-	-	0.007	-	0.0073	1			0.0073	J										
Benzo(k)fluoranthene	207-08-9	ug/L	c	0.34	-	0.34	0	-	0	0														
Chrysene	218-01-9	ug/L	c	3.4	-	3.4	0	-	0	0														
Dibenzo(a,h)anthracene	53-70-3	ug/L	c	0.0034	-	0.0034	0.006	-	0.0057	1			0.0057	J										
Fluoranthene	206-44-0	ug/L	n	80	-	80	0	-	0	0														
Fluorene	86-73-7	ug/L	n	29	-	29	0	-	0	0														
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	c	0.034	-	0.034	0.006	-	0.006	1			0.006	J										
Naphthalene	91-20-3	ug/L	c	0.17	-	0.17	0.006	-	0.045	8							0.0078	J						
Pentachlorophenol	87-86-5	ug/L	c	0.041	1	0.041	0	-	0	0	NA		NA		NA		NA		NA		NA		NA	
Phenanthrene	85-01-8	ug/L	-	-	-	-	0.008	-	0.011	2	0.011	J							0.0075	J				
Pyrene	129-00-0	ug/L	n	12	-	12	0	-	0	0														

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associat

Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-17d

Semivolatile Organic Compounds (SVOCs) Detected in Deep Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range	Frequency	MW13D	MW13I	MW14D	MW15D	MW16D	MW17D	MW18D	MW19	MW21D	MW21S	MW22	MW23D	MW23I	MW23S
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,1'-Biphenyl	92-52-4	n	0.083	-	0.083	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
1,2,4,5-Tetrachlorobenzene	95-94-3	n	0.17	-	0.17	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
1,4-Dioxane	123-91-1	c	0.46	-	0.46	UG/L	0.24 - 32	5	8.3	13				0.24 J		32			0.33 J			
2,2'-oxybis(1-chloropropane)	108-60-1	n	71	-	71	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2,3,4,6-Tetrachlorophenol	58-90-2	n	24	-	24	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2,4,5-Trichlorophenol	95-95-4	n	120	-	120	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2,4,6-Trichlorophenol	88-06-2	n	1.2	-	1.2	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2,4-Dichlorophenol	120-83-2	n	4.6	-	4.6	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2,4-Dimethylphenol	105-67-9	n	36	-	36	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2,4-Dinitrophenol	51-28-5	n	3.9	-	3.9	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2,4-Dinitrotoluene	121-14-2	c	0.24	-	0.24	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2,6-Dinitrotoluene	606-20-2	c	0.049	-	0.049	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2-Chloronaphthalene	91-58-7	n	75	-	75	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2-Chlorophenol	95-57-8	n	9.1	-	9.1	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2-Methylnaphthalene	91-57-6	n	3.6	-	3.6	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
2-Methylphenol	95-48-7	n	93	-	93	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2-Nitroaniline	88-74-4	n	19	-	19	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
2-Nitrophenol	88-75-5	-	-	-	-	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
3,3'-Dichlorobenzidine	91-94-1	c	0.13	-	0.13	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
3-Nitroaniline	99-09-2	-	-	-	-	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
4,6-Dinitro-2-methylphenol	534-52-1	n	0.15	-	0.15	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
4-Bromophenyl-phenylether	101-55-3	-	-	-	-	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
4-Chloro-3-methylphenol	59-50-7	n	140	-	140	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
4-Chloroaniline	106-47-8	c	0.37	-	0.37	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
4-Chlorophenyl-phenylether	7005-72-3	-	-	-	-	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
4-Methylphenol	106-44-5	n	190	-	190	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
4-Nitroaniline	100-01-6	c	3.8	-	3.8	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
4-Nitrophenol	100-02-7	-	-	-	-	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Acenaphthene	83-32-9	n	53	-	53	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Acenaphthylene	208-96-8	-	-	-	-	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Acetophenone	98-86-2	n	190	-	190	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Anthracene	120-12-7	n	180	-	180	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Atrazine	1912-24-9	c	0.3	3	0.3	UG/L	0 - 0	0			NA	NA		NA	NA				NA			

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-17d
Semivolatile Organic Compounds (SVOCs) Detected in Deep Groundwater - Outside Landfill Boundary (July 2015)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range	Frequency	MW13D	MW13I	MW14D	MW15D	MW16D	MW17D	MW18D	MW19	MW21D	MW21S	MW22	MW23D	MW23I	MW23S
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzaldehyde	100-52-7	n	190	-	190	UG/L	1.1 - 1.1	1			NA	NA		NA	NA	1.1 J			NA			
Benzo(a)anthracene	56-55-3	c	0.012	-	0.012	UG/L	0 - 0	0			NA	NA		NA	NA	NA		NA	NA		NA	
Benzo(a)pyrene	50-32-8	c	0.0034	0.2	0.0034	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Benzo(b)fluoranthene	205-99-2	c	0.034	-	0.034	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA			NA
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Benzo(k)fluoranthene	207-08-9	c	0.34	-	0.34	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Bis(2-Chloroethoxy)methane	111-91-1	n	5.9	-	5.9	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Bis(2-Chloroethyl)ether	111-44-4	c	0.014	-	0.014	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
bis(2-ethylhexyl)phthalate	117-81-7	c	5.6	6	5.6	UG/L	0.74 - 1.2	4	1.1 J	1.2 J	NA	NA	0.74 J	NA	NA				NA	0.96 J		
Butylbenzylphthalate	85-68-7	c	16	-	16	UG/L	0.55 - 0.59	2		0.59 J	NA	NA		NA	NA				NA	0.55 J		
Caprolactam	105-60-2	n	990	-	990	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Carbazole	86-74-8	-	-	-	-	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Chrysene	218-01-9	c	3.4	-	3.4	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Dibenzo(a,h)anthracene	53-70-3	c	0.0034	-	0.0034	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Dibenzofuran	132-64-9	n	0.79	-	0.79	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Diethylphthalate	84-66-2	n	1500	-	1500	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Dimethylphthalate	131-11-3	-	-	-	-	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Di-n-butylphthalate	84-74-2	n	90	-	90	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Di-n-octylphthalate	117-84-0	n	20	-	20	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Fluoranthene	206-44-0	n	80	-	80	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Fluorene	86-73-7	n	29	-	29	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Hexachlorobenzene	118-74-1	c	0.0098	1	0.0098	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Hexachlorobutadiene	87-68-3	c	0.14	-	0.14	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Hexachlorocyclopentadiene	77-47-4	n	0.041	50	0.041	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Hexachloroethane	67-72-1	c	0.33	-	0.33	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Indeno(1,2,3-cd)pyrene	193-39-5	c	0.034	-	0.034	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Isophorone	78-59-1	c	78	-	78	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Naphthalene	91-20-3	c	0.17	-	0.17	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Nitrobenzene	98-95-3	c	0.14	-	0.14	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
N-Nitroso-di-n-propylamine	621-64-7	c	0.011	-	0.011	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
N-Nitrosodiphenylamine	86-30-6	c	12	-	12	UG/L	0 - 0	0			NA	NA		NA	NA				NA			
Pentachlorophenol	87-86-5	c	0.041	1	0.041	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Phenanthrene	85-01-8	-	-	-	-	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA
Phenol	108-95-2	n	580	-	580	UG/L	1.7 - 1.7	1	1.7 J		NA	NA		NA	NA				NA			
Pyrene	129-00-0	n	12	-	12	UG/L	0 - 0	0			NA	NA		NA	NA	NA	NA	NA	NA		NA	NA

* USEPA Region III Regional Screening Level (RSL), November 2015
** Pennsylvania Maximum Contaminant Levels
Highlighted concentrations are over Project Screening Levels

Table 4-17e

PAHs Detected in Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW13D		MW13I		MW16D		MW19		MW21D		MW21S		MW23D		MW23I		MW23S	
											Result		Result		Result		Result		Result		Result		Result		Result		Result	
2-Methylnaphthalene	91-57-6	n	3.6	-	3.6	UG/L	0	-	0	0																		
Acenaphthene	83-32-9	n	53	-	53	UG/L	0	-	0	0																		
Acenaphthylene	208-96-8	-	-	-	-	UG/L	0	-	0	0																		
Anthracene	120-12-7	n	180	-	180	UG/L	0	-	0	0																		
Benzo(a)anthracene	56-55-3	c	0.012	-	0.012	UG/L	0	-	0	0																		
Benzo(a)pyrene	50-32-8	c	0.0034	0.2	0.0034	UG/L	0.077	-	0.077	1	0.077	J																
Benzo(b)fluoranthene	205-99-2	c	0.034	-	0.034	UG/L	0	-	0	0																		
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	UG/L	0	-	0	0																		
Benzo(k)fluoranthene	207-08-9	c	0.34	-	0.34	UG/L	0	-	0	0																		
Chrysene	218-01-9	c	3.4	-	3.4	UG/L	0	-	0	0																		
Dibenzo(a,h)anthracene	53-70-3	c	0.0034	-	0.0034	UG/L	0	-	0	0																		
Fluoranthene	206-44-0	n	80	-	80	UG/L	0	-	0	0																		
Fluorene	86-73-7	n	29	-	29	UG/L	0	-	0	0																		
Indeno(1,2,3-cd)pyrene	193-39-5	c	0.034	-	0.034	UG/L	0	-	0	0																		
Naphthalene	91-20-3	c	0.17	-	0.17	UG/L	0	-	0	0																		
Pentachlorophenol	87-86-5	c	0.041	1	0.041	UG/L	0	-	0	0																		
Phenanthrene	85-01-8	-	-	-	-	UG/L	0	-	0	0																		
Pyrene	129-00-0	n	12	-	12	UG/L	0	-	0	0																		

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-18
Pesticides Detected in Deep Groundwater - Outside Landfill Boundary (July 2015)
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW13D		MW13I		MW14D		MW15D		MW16D		MW17D		MW18D		MW19		MW23D		MW23I		MW23S	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
4,4´-DDD	72-54-8	c	32	-	32	NG/L	0	-	0	0																						
4,4´-DDE	72-55-9	c	46	-	46	NG/L	0	-	0	0																						
4,4´-DDT	50-29-3	c	230	-	230	NG/L	0	-	0	0																						
Aldrin	309-00-2	c	0.92	-	0.92	NG/L	0	-	0	0																						
alpha-BHC	319-84-6	c	7.2	-	7.2	NG/L	0	-	0	0																						
alpha-Chlordane	5103-71-9	c	45	-	45	NG/L	0	-	0	0																						
beta-BHC	319-85-7	c	25	-	25	NG/L	0	-	0	0																						
delta-BHC	319-86-8	-	-	-	-	NG/L	0	-	0	0																						
Dieldrin	60-57-1	c	1.8	-	1.8	NG/L	2.24	-	2.24	1					2.24	J																
Endosulfan I	959-98-8	n	10000	-	10000	NG/L	0	-	0	0																						
Endosulfan II	33213-65-9	n	10000	-	10000	NG/L	0	-	0	0																						
Endosulfan sulfate	1031-07-8	n	10000	-	10000	NG/L	0	-	0	0																						
Endrin	72-20-8	n	230	2000	230	NG/L	0	-	0	0																						
Endrin aldehyde	7421-93-4	n	230	-	230	NG/L	0	-	0	0																						
Endrin ketone	53494-70-5	n	230	-	230	NG/L	0	-	0	0																						
gamma-BHC (Lindane)	58-89-9	c	42	200	42	NG/L	0	-	0	0																						
gamma-Chlordane	5103-74-2	c	45	-	45	NG/L	0	-	0	0																						
Heptachlor	76-44-8	c	1.4	400	1.4	NG/L	0	-	0	0																						
Heptachlor epoxide	1024-57-3	c	1.4	200	1.4	NG/L	0	-	0	0																						
Methoxychlor	72-43-5	n	3700	40000	3700	NG/L	0	-	0	0																						
Toxaphene	8001-35-2	c	71	3000	71	NG/L	0	-	0	0																						

Data Qualifiers:

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-19

Dioxins Detected in Deep Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range	Frequency	MW13D	MW13I	MW14D	MW15D	MW15D-DUP	MW16D	MW16D-DUP	MW17D	MW18D	MW19	MW21D	MW22	MW23D
									Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
1,2,3,4,6,7,8-HpCDD	35822-46-9	pg/L	-	-	-	-	2.13 - 6.48	4	5.26 J		6.48 Z						2.13 J				3.05 J
1,2,3,4,6,7,8-HpCDF	67562-39-4	pg/L	-	-	-	-	2.99 - 2.99	1												2.99 Z	
1,2,3,4,7,8,9-HpCDF	55673-89-7	pg/L	-	-	-	-	1.22 - 1.22	1					1.22 J								
1,2,3,4,7,8-HxCDD	39227-28-6	pg/L	-	-	-	-	1.41 - 1.41	1										1.41 Z			
1,2,3,4,7,8-HxCDF	70648-26-9	pg/L	-	-	-	-	1.05 - 1.78	2										1.78 J		1.05 Z	
1,2,3,6,7,8-HxCDD	57653-85-7	pg/L	-	-	-	-	1.34 - 1.34	1										1.34 J			
1,2,3,6,7,8-HxCDF	57117-44-9	pg/L	-	-	-	-	0.442 - 1.16	2										1.16 J		0.442 Z	
1,2,3,7,8,9-HxCDD	19408-74-3	pg/L	-	-	-	-	0.384 - 1.4	3									0.868 J	1.4 Z		0.384 Z	
1,2,3,7,8,9-HxCDF	72918-21-9	pg/L	-	-	-	-	1.67 - 1.67	1										1.67 J			
1,2,3,7,8-PeCDD	40321-76-4	pg/L	-	-	-	-	0.538 - 0.906	2									0.538 J	0.906 J			
1,2,3,7,8-PeCDF	57117-41-6	pg/L	-	-	-	-	0.976 - 0.976	1										0.976 J			
2,3,4,6,7,8-HxCDF	60851-34-5	pg/L	-	-	-	-	0.273 - 0.845	3	0.273 Z								0.761 Z	0.845 Z			
2,3,4,7,8-PeCDF	57117-31-4	pg/L	-	-	-	-	0.759 - 0.759	1									0.759 Z				
2,3,7,8-TCDD	1746-01-6	pg/L	c	0.1	30	0.12	0 - 0	0													
2,3,7,8-TCDF	51207-31-9	pg/L	-	-	-	-	0 - 0	0													
OCDD	3268-87-9	pg/L	-	-	-	-	271 - 271	1						271							
OCDF	39001-02-0	pg/L	-	-	-	-	0 - 0	0													
Total HpCDD	37871-00-4	pg/L	-	-	-	-	5.09 - 10.2	2			10.2 Z										5.09 J
Total HpCDF	38998-75-3	pg/L	-	-	-	-	2.99 - 2.99	1												2.99 Z	
Total HxCDD	34465-46-8	pg/L	-	-	-	-	0.868 - 4.15	4	2.16 J								0.868 J	4.15 Z		0.916 Z	
Total HxCDF	55684-94-1	pg/L	-	-	-	-	1.92 - 5.44	2										5.44 Z		1.92 Z	
Total PeCDD	36088-22-9	pg/L	-	-	-	-	0.538 - 0.906	2									0.538 J	0.906 J			
Total PeCDF	30402-15-4	pg/L	-	-	-	-	0.759 - 0.976	2									0.759 Z	0.976 J			
Total TCDD	41903-57-5	pg/L	-	-	-	-	0 - 0	0													
Total TCDF	55722-27-5	pg/L	-	-	-	-	0 - 0	0													
Total TEQ - Bird	2222-20-0	pg/L	-	-	-	-	0.991 - 24.5	13	1.31	0.991	20.8	2.69	7.15	11	2.13	1.18	2.17	3.07	24.5	1.65	18.4
Total TEQ - Fish	2222-21-0	pg/L	-	-	-	-	0.08 - 15.8	13	0.0804	0.905	13.2	2.48	4.89	7.02	1.74	0.994	1.75	3.01	15.8	1.41	11.7
Total TEQ - Mammal	3333-30-0	pg/L	c	0.1	30	0.12	0 - 6.1	13	1.16	0	0.0648	0	0.000819	6.1	1.66	0	0.874	1.9	0	0.218	0.0305

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Anions, Dissolved Gas, and PFCs Detected in Deep Groundwater - Outside Landfill Boundary (December 2014)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	Units	Key	RSL	MCL	Screening Value	Range			Frequency	MW13D		MW13I		MW14D		MW15D		MW16D		MW17D		MW18D		MW19		MW21D		MW21S		MW22		MW23D		MW23I		MW23S	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Methane	74-82-8	mg/l	-	-	-	-	0.00172	-	0.557	13	0.00379		0.0567		0.00172		0.0142		0.513		0.0114		0.0755		0.557		0.0753		0.0226				0.0662		0.0417		0.031	
Nitrate	14797-55-8	mg/l	n	3.2	10	3.2	0.15	-	0.15	3	NA														0.15										0.15		0.15	
Nitrite	14797-65-0	mg/l	n	0.2	1	0.2	0.05	-	0.5	3	NA														0.5										0.05		0.05	
Sulfate	14808-79-8	mg/l	-	-	-	-	2.7	-	101	13	NA		44.7		38.8		2.7		12.1		64.5		14.7		22.7		39.6		47.5		4.43		68.1		70.9		101	
Perfluorobutanesulfonic Acid	375-73-5	ug/l	-	-	-	0.2	0	-	0	0																												
Perfluoroheptanoic acid	375-85-9	ug/l	-	-	-	-	0.0082	-	0.057	4	0.0092	J	0.017												0.057	J											0.0082	J
Perfluorohexanesulfonic Acid	355-46-4	ug/l	-	-	-	-	0.014	-	0.11	3	0.014	J	0.02	J											0.11	J												
Perfluorononanoic Acid	375-95-1	ug/l	-	-	-	-	0.018	-	0.018	1															0.018	J												
Perfluorooctanesulfonic Acid	1763-23-1	ug/l	-	-	-	0.04	0.016	-	0.14	3	0.017	J	0.016	J											0.14	J												
Perfluorooctanoic Acid	335-67-1	ug/l	-	-	-	0.04	0.014	-	0.15	8	0.027		0.044												0.15	J	0.014	J	0.019	J			0.015	J	0.017	J	0.068	

Data Qualifiers:

J- -- Indicates that result is biased low.

J -- Value is considered estimated due to exceedance of technical quality control criteria or because result is less than the Contract Required Quantitation Limit (CRQL).

J+ -- Indicates that result is biased high.

Z -- The isomer was identified with an ion ratio outside the 15% theoretical ion abundance ratio; the associatednumerical value is reported as the Estimated Maximum Possible Concentration (EMPC) and is considered estimated.

NA -- No result is available/applicable for this parameter in this sample.

Table 4-20b

Anions, Dissolved Gas, and PFCs Detected in Deep Groundwater - Outside Landfill Boundary (July 2015)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW13D		MW13I		MW14D		MW15D		MW16D		MW17D		MW18D		MW19		MW21D		MW21S		MW22		MW23D		MW23I		MW23S	
											Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
Nitrate	14797-55-8	n	3.2	10	3.2	MG/L	0.186	-	0.186	1							0.186																					
Nitrite	14797-65-0	n	0.2	1	0.2	MG/L	0	-	0	0																												
Sulfate	14808-79-8	-	-	-	-	MG/L	2.64	-	105	13	25.1		37.3		35.8		2.64		12.3		62.7		12.9		21.5		44.7		48.2				77.7		69.5		105	
Acetylene	74-86-2	-	-	-	-	UG/L	43.8	-	71.9	8	43.8		54.4		NA		NA		52.2		55.7		48.6		NA		NA		66.8		71.9		67.2		NA		NA	
Methane	74-82-8	-	-	-	-	UG/L	2.1	-	540	14	21		65		4.3		8.7		540	J	6.7		53		370		44		44		2.1		70		53		41	
Perfluorooctanesulfonic Acid	1763-23-1	-	-	-	0.04	UG/L	0.024	-	0.028	2	0.028	J	0.024	J	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Perfluorooctanoic Acid	335-67-1	-	-	-	0.04	UG/L	0.031	-	0.049	2	0.031		0.049		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	

* USEPA Region III Regional Screening Level (RSL), November 2015

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Table 4-20c

Anions and Dissolved Gas Detected in Deep Groundwater - Outside Landfill Boundary (April 2016)

Lower Darby Creek Area (LDCA)

Clearview Landfill - Operable Unit 3 (OU-3)

Analyte	CAS	KEY	RSL*	MCL**	Screening Value	Units	Range			Frequency	MW13D		MW13I		MW14D		MW15D		MW21D		MW21S	
											Result		Result		Result		Result		Result		Result	
Sulfate	14808-79-8	-	-	-	-	MG/L	37.4	-	54.6	4			37.4		54.6		NA		43.2		47.5	
Acetylene	74-86-2	-	-	-	-	UG/L	74.5	-	79.8	2	NA		NA		79.8		74.5		NA		NA	
Methane	74-82-8	-	-	-	-	UG/L	1.3	-	12	2	NA		NA		1.3		12		NA		NA	

* USEPA Region III Regional Screening Level (RSL), May 2016

** Pennsylvania Maximum Contaminant Levels

Highlighted concentrations are over Project Screening Levels

Total Inorganics Detected in Pore Water (May 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			LD103		LD106		LD108		LD110		LD114		LD116		LD118		LD123		LD126		LD129		LD132	
					Maximum	Number of	Number of	5/2/13		5/2/13		5/2/13		5/2/13		5/3/13		5/3/13		5/3/13		5/3/13		5/2/13		5/2/13		5/2/13	
Analyte	CAS	Units	BTAG	B	Detection	Detections	Exceedance	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Aluminum	7429-90-5	ug/L	87	-	6680	10	8	445				1080		215		1310		84.8		213				5350		872		57.2	
Arsenic	7440-38-2	ug/L	5	B	14.9	12	7	2.5	J	6.1	J	12.3	J	14.9	J	6.7	J	4.7	J	4.1	J	4.2	J	7.3	J	5.4	J	3.1	J
Barium	7440-39-3	ug/L	4	-	1390	12	12	809		825		1390		535		496		311		336		953		1290		818		1320	
Beryllium	7440-41-7	ug/L	0.66	-	1.4	2	2																	1.3					
Cadmium	7440-43-9	ug/L	0.25	B	5	2	2																	5					
Calcium	7440-70-2	ug/L	116000	-	176000	12	5	167000		128000		95800		142000		76300		106000		104000		101000		159000		108000		176000	
Chromium	7440-47-3	ug/L	85	-	32.4	12	0	4.8		4.2		11.4		18.8		32.4		21.8		18.9		11.9		17.2		7.3		2.6	
Cobalt	7440-48-4	ug/L	23	-	16.6	12	0	2.2	J	3.2	J	3.9	J	7.5	J	10.9	J	10.8	J	8.5	J	8.4	J	14.9	J	5.3	J	1.1	J
Copper	7440-50-8	ug/L	9	B	371	9	6	14.1	J			40	J	6.5	J	14.6	J	2.1	J	3.8	J			371	J	37	J		
Iron	7439-89-6	ug/L	300	-	46700	12	12	37100	J	25900	J	46700	J	32200	J	15200	J	14600	J	12500	J	16400	J	31600	J	17000	J	34300	J
Lead	7439-92-1	ug/L	2.5	B	676	11	10	39.5		2.1		176		21.8		73.4		6		9.1				676		80.4		15.2	
Magnesium	7439-95-4	ug/L	82000	-	130000	12	4	68700		86500		76400		76300		74500		70200		71500		122000		130000		98200		72800	
Manganese	7439-96-5	ug/L	120	-	4890	12	11	725		144		362		404		274		270		295		71.3		1190		271		380	
Nickel	7440-02-0	ug/L	52	B	26.6	12	0	5.2	J	7.7	J	7.2	J	8.9	J	17.5	J	13.2	J	9.9	J	6.6	J	26.6	J	8	J	2.1	J
Potassium	7440-09-7	ug/L	53000	-	127000	12	9	36300	J	57800	J	57800	J	90900	J	127000	J	111000	J	97500	J	108000	J	65700	J	68100	J	28200	J
Selenium	7782-49-2	ug/L	1	B	8.1	10	10	2	J	2.1	J	2	J	5.3		8.1		6.5		5.5		5.8		4.3	J	5.4			
Sodium	7440-23-5	ug/L	700000	-	834000	12	1	114000		127000		113000		517000		834000		632000		574000		494000		313000		298000		103000	
Vanadium	7440-62-2	ug/L	20	-	44.1	10	4	7.9	J			10.6	J	22.8	J	29.3	J	18.9	J	8.7	J	3.4	J	39.2	J	8.9	J		
Zinc	7440-66-6	ug/L	120	B	1080	12	3	44.4		67.6		100		19		120		12.3		9.5		2	J	1080		137		11.5	

NA = Not Analyzed

Blank Cell = Not Detected

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

The BTAG values in bold are expressed in terms of dissolved metals.

1 - Duplicate samples were not included in the summary statistics.

Analyte	CAS	Units	BTAG	B	Summary Statistics[1] Maximum Detection	Number of Detections	Number of Exceedance	LD132D 5/2/13 Result	Flag	LD136 5/2/13 Result	Flag
Aluminum	7429-90-5	ug/L	87	-	6680	10	8	6290		6680	
Arsenic	7440-38-2	ug/L	5	B	14.9	12	7	7.5	J	7.5	J
Barium	7440-39-3	ug/L	4	-	1390	12	12	462		500	
Beryllium	7440-41-7	ug/L	0.66	-	1.4	2	2	1.3		1.4	
Cadmium	7440-43-9	ug/L	0.25	B	5	2	2	2.4		2.5	
Calcium	7440-70-2	ug/L	116000	-	176000	12	5	66500		74500	
Chromium	7440-47-3	ug/L	85	-	32.4	12	0	15.4		14.2	
Cobalt	7440-48-4	ug/L	23	-	16.6	12	0	13.8	J	16.6	J
Copper	7440-50-8	ug/L	9	B	371	9	6	110	J	82.4	J
Iron	7439-89-6	ug/L	300	-	46700	12	12	33100	J	38200	J
Lead	7439-92-1	ug/L	2.5	B	676	11	10	279		263	
Magnesium	7439-95-4	ug/L	82000	-	130000	12	4	23000		26600	
Manganese	7439-96-5	ug/L	120	-	4890	12	11	4370		4890	
Nickel	7440-02-0	ug/L	52	B	26.6	12	0	20.6	J	24.2	J
Potassium	7440-09-7	ug/L	53000	-	127000	12	9	5600	J	5900	J
Selenium	7782-49-2	ug/L	1	B	8.1	10	10				
Sodium	7440-23-5	ug/L	700000	-	834000	12	1	33300		34100	
Vanadium	7440-62-2	ug/L	20	-	44.1	10	4	36.2	J	44.1	J
Zinc	7440-66-6	ug/L	120	B	1080	12	3	555		613	

NA = Not Analyzed
Blank Cell = Not Detected
BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)
B = Bioaccumulative
Highlighted values indicate their exceedances of BTAG benchmark.
The BTAG values in bold are expressed in terms of dissolved metals.
1 - Duplicate samples were not included in the summary statistics.

Table 4-21b

Total Inorganics Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			0301-00		0301-02		0301-02DUP		0302-00		0302-02		0303-00		0303-02		1001-00		1001-02		1001-02DUP		1001-04	
					Maximum	Number of	Number of	9/9/13		9/9/13		9/9/13		9/9/13		9/9/13		9/9/13		9/9/13		9/11/13		9/11/13		9/11/13		9/11/13	
Analyte	CAS	Units	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Aluminum	7429-90-5	ug/L	87	-	1420	28	6	40		101										1420		10.2	J	1.4	J	1.6	J	34.6	
Arsenic	7440-38-2	ug/L	5	B	26.5	38	16	14.7	J+	8.1	J+	8.4	J+	3.3	J+	11.4	J+	1.2	J+	6.8	J+	10	J+	1.1	J+	1.2	J+	6.2	J+
Barium	7440-39-3	ug/L	4	-	637	38	38	469		466		453		112		480		95.7		472		401	J	143	J	143	J	438	
Beryllium	7440-41-7	ug/L	0.66	-	0.051	1	0																						
Boron	7440-42-8	ug/L	1.6	-	7310	38	38	475		952		948		41.6		946		43.5		642		285		2040		1720		5830	
Calcium	7440-70-2	ug/L	116000	-	150000	38	5	106000		127000		122000		39200		97500		37400		94700		95400		126000		106000		143000	
Chromium	7440-47-3	ug/L	85	-	20.6	36	0	0.84	J	2.7		1.9	J	0.19	J	0.91	J	0.2	J	20.6		0.83	J	1.4	J	1.5	J	10	
Cobalt	7440-48-4	ug/L	23	-	21.9	27	0	3.1		2.3		2.1		1.8		1.6				3		7.6		1.8		1.7		7.9	
Copper	7440-50-8	ug/L	9	B	10.8	20	1			2.7										10.8		0.29	J-						
Cyanide	57-12-5	ug/L	5	-	26.6	4	2	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Iron	7439-89-6	ug/L	300	-	81500	38	32	81500		76000		72300		2500		78700		1230		45900		23800		8860		10000		41400	
Lead	7439-92-1	ug/L	2.5	B	183	27	14	4		9.3										183		0.8	J			0.23	J	1.8	
Magnesium	7439-95-4	ug/L	82000	-	124000	38	3	45800		64100		60400		16100		61400		16700		56400		35600		69500		60000		124000	
Manganese	7439-96-5	ug/L	120	-	5020	38	35	3200		2360		2360		1100		1960		280		2440		4430		2410		2060		744	
Mercury	7439-97-6	ug/L	0.026	-	0.13	25	25	0.13	J	0.12	J	0.099	J	0.13	J			0.13	J	0.11	J	0.035	J			0.037	J	0.054	J
Nickel	7440-02-0	ug/L	52	B	48.3	38	0	2.5	J	2.4	J	1.6	J	1.9	J	1.6	J	0.98	J	11.5	J	5.4		2.1		1.8		5.4	J
Potassium	7440-09-7	ug/L	53000	-	169000	38	7	11400		16500		16100		5210		14300		4560		8960		9910		21200		21500		74600	
Selenium	7782-49-2	ug/L	1	B	24.1	20	14															1.2	J	2.9	J	2.8	J	7.9	J
Sodium	7440-23-5	ug/L	700000	-	748000	38	3	60800	J	131000	J	126000	J	39000	J	107000	J	40000	J	93400	J	51200		136000		117000		358000	J
Vanadium	7440-62-2	ug/L	20	-	14	9	0													12.5								5.5	J
Zinc	7440-66-6	ug/L	120	B	133	38	1	7.6		11		12		9.6		3.2		7.3		133		21.3	J	2.8	J	1.7	J	4.5	

NA = Not Analyzed

Blank Cell = Not Detected

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

The BTAG values in bold are expressed in terms of dissolved metals.

1 - Duplicate samples were not included in the summary statistics.

Table 4-21b

Total Inorganics Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			1002-00		1002-02		1002-04		1003-00		1003-02		1601-00		1601-02		1602-00		1602-02		1602-04		1603-00	
					Maximum	Number of	Number of	9/11/13		9/11/13		9/11/13		9/10/13		9/10/13		9/11/13		9/11/13		9/11/13		9/11/13		9/11/13		9/12/13	
Analyte	CAS	Units	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Aluminum	7429-90-5	ug/L	87	-	1420	28	6			29.1				11.2	J	20.4		18.4	J	26.9						91.4		12.7	J
Arsenic	7440-38-2	ug/L	5	B	26.5	38	16	4.2	J+	7.5	J+	3.3	J+	0.55	J+	4.1	J+	1.6	J+	3.5	J+	0.72	J+	1.9	J+	6.9	J+	1.4	J+
Barium	7440-39-3	ug/L	4	-	637	38	38	217		258		230		97.8	J	102	J	96.8	J	96.2	J	86	J	100		447		106	J
Beryllium	7440-41-7	ug/L	0.66	-	0.051	1	0																						
Boron	7440-42-8	ug/L	1.6	-	7310	38	38	62.6		559		5670		29.2		24.2		48.1		805		31.2		38.5		1160		36.6	
Calcium	7440-70-2	ug/L	116000	-	150000	38	5	38300		65600		150000		38600		37800		36800		36200		38600	J	40100		24200		36100	
Chromium	7440-47-3	ug/L	85	-	20.6	36	0	0.17	J	0.84	J	7.7				0.28	J	0.26	J	7.2		0.13	J	0.51	J	18.2		0.19	J
Cobalt	7440-48-4	ug/L	23	-	21.9	27	0	2.1				7		0.5	J	0.72	J	0.54	J	2.1						21.9		0.2	J
Copper	7440-50-8	ug/L	9	B	10.8	20	1							0.93	J	0.094	J	0.92	J	0.11	J-							1.3	J
Cyanide	57-12-5	ug/L	5	-	26.6	4	2	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA			
Iron	7439-89-6	ug/L	300	-	81500	38	32	3530		31500		8420		34	J	5890		1080		2030		71.1	J	5250		20500		384	
Lead	7439-92-1	ug/L	2.5	B	183	27	14			2.4				0.41	J	0.58	J	1.9		1.4						4.6		0.64	J
Magnesium	7439-95-4	ug/L	82000	-	124000	38	3	15600		25600		119000		15500		14300		14500		19900		16700	J	16700		19200		15000	
Manganese	7439-96-5	ug/L	120	-	5020	38	35	1340		1690		647		357		958		433		213		11.9		449		386		78.8	
Mercury	7439-97-6	ug/L	0.026	-	0.13	25	25	0.058	J	0.13	J	0.064	J	0.043	J									0.094	J	0.065	J		
Nickel	7440-02-0	ug/L	52	B	48.3	38	0	2	J	0.75	J	4.7	J	1.1		0.95	J	1.2		3		0.84	J	0.67	J	48.3	J	0.85	J
Potassium	7440-09-7	ug/L	53000	-	169000	38	7	5680		10900		80900		4570		4360		4740		23200		4500	J	5000		47700		4390	
Selenium	7782-49-2	ug/L	1	B	24.1	20	14					6.8	J	0.55	J	0.48	J	0.64	J	2.6	J					20.3	J	0.75	J
Sodium	7440-23-5	ug/L	700000	-	748000	38	3	39800	J	53100	J	306000	J	37300		29300		34700		144000		39400	J	39600	J	627000	J	36800	
Vanadium	7440-62-2	ug/L	20	-	14	9	0													6.5	J					5.5			
Zinc	7440-66-6	ug/L	120	B	133	38	1	13.9		4.3		1.6	J	7	J	3.9	J	7.6	J	2	J	9.4		3.4		7.3		8.6	J

NA = Not Analyzed

Blank Cell = Not Detected

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

The BTAG values in bold are expressed in terms of dissolved metals.

1 - Duplicate samples were not included in the summary statistics.

Table 4-21b

Total Inorganics Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			1603-00DUP		1603-02		1603-04		1603-04DUP		1802-00		1802-02		1803-00		2501-00		2501-02		2502-00		2502-02	
					Maximum	Number of	Number of	9/12/13		9/12/13		9/12/13		9/12/13		9/13/13		9/13/13		9/13/13		9/12/13		9/12/13		9/12/13		9/12/13	
Analyte	CAS	Units	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Aluminum	7429-90-5	ug/L	87	-	1420	28	6	15.2	J	16	J	81.6		45.2		75.9		20.5		120	J	41.7		34.5		11.3	J	229	
Arsenic	7440-38-2	ug/L	5	B	26.5	38	16	1.4	J+	6.8	J+	7.8	J+	7.8	J+	1.1	J+	0.76	J+	0.76	J+	10.7	J+	26.5	J+	7.2	J+	17.3	J+
Barium	7440-39-3	ug/L	4	-	637	38	38	117	J	301	J	637	J	643	J	52.1	J	63.1	J	33.5	J	635	J	574	J	414	J	567	J
Beryllium	7440-41-7	ug/L	0.66	-	0.051	1	0																					0.051	J
Boron	7440-42-8	ug/L	1.6	-	7310	38	38	34.9		218		626		657		30.7		42.8		21.9		3400		6040		856		5840	
Calcium	7440-70-2	ug/L	116000	-	150000	38	5	38400		80800		58900		62900		22200		38300		15000	J	97200		48200		88300		60100	
Chromium	7440-47-3	ug/L	85	-	20.6	36	0	0.16	J	4.1		16.8		16.4		0.39	J	0.21	J	0.57	J	10.4		18.2		2.8		14.2	
Cobalt	7440-48-4	ug/L	23	-	21.9	27	0	0.2	J	3.6		20.3		20.8		0.34	J	0.93	J			17		17.7		7.4		11.3	
Copper	7440-50-8	ug/L	9	B	10.8	20	1	1.6	J	0.12	J-	0.67	J	0.38	J-	5.3		0.62	J	8.8	J	2.2		1.3	J	1	J	4.4	
Cyanide	57-12-5	ug/L	5	-	26.6	4	2					26.6		21.5	J							2	J	8.2	J				
Iron	7439-89-6	ug/L	300	-	81500	38	32	358		31800		34700		33900		293		49.6	J	252		7450		15200		7950		19000	
Lead	7439-92-1	ug/L	2.5	B	183	27	14	0.87	J	0.74	J	10.1		3.2		2.6		7.6		4.8	J	4.4		4.9		1.1		19	
Magnesium	7439-95-4	ug/L	82000	-	124000	38	3	15300		36500		37100		35200		7730		13900		5760	J	60700		81100		35400		55700	
Manganese	7439-96-5	ug/L	120	-	5020	38	35	82.2		1250		850		887		147		138		10		5020		3210		3850		2450	
Mercury	7439-97-6	ug/L	0.026	-	0.13	25	25	0.044	J	0.042	J							0.047	J	0.034	J							0.035	J
Nickel	7440-02-0	ug/L	52	B	48.3	38	0	0.96	J	5.6		36.1		36.4		1.1		1.7		0.97	J	40.8		30.5		17.2		31.7	
Potassium	7440-09-7	ug/L	53000	-	169000	38	7	4570		26700		66900		69600		3820		4470		3250	J	82200		147000		20700		148000	
Selenium	7782-49-2	ug/L	1	B	24.1	20	14	0.9	J	6.3		24.1		25.8		0.5	J	0.3	J			9.1		12.1		4	J	12.4	
Sodium	7440-23-5	ug/L	700000	-	748000	38	3	37800		173000		695000		694000		19300		28400		13000	J	412000		651000		181000		727000	
Vanadium	7440-62-2	ug/L	20	-	14	9	0					7.2		6.9								7.2		14				7.9	
Zinc	7440-66-6	ug/L	120	B	133	38	1	15.9	J	2.9	J	14.3	J	7.6	J	13.5	J	32.8	J	12		39.7	J	33.7	J	16.1	J	49	J

NA = Not Analyzed

Blank Cell = Not Detected

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

The BTAG values in bold are expressed in terms of dissolved metals.

1 - Duplicate samples were not included in the summary statistics.

Table 4-21b

Total Inorganics Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[(1)]			2503-00		2503-02		3301-00		3301-02		3302-00		3302-02		3302-04		3303-00		3303-02	
					Maximum	Number of	Number of	9/12/13		9/12/13		9/10/13		9/10/13		9/10/13		9/10/13		9/10/13		9/10/13		9/10/13	
Analyte	CAS	Units	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Aluminum	7429-90-5	ug/L	87	-	1420	28	6	23		69.4		22.6		84.2				54.3		103					
Arsenic	7440-38-2	ug/L	5	B	26.5	38	16	2.2	J+	17.3	J+	0.74	J+	8.1	J+	3.6	J+	3	J+	2.1	J+	3	J+	3.5	J+
Barium	7440-39-3	ug/L	4	-	637	38	38	224	J	420	J	114		41.4		104		91.7		378		52.5		424	
Beryllium	7440-41-7	ug/L	0.66	-	0.051	1	0																		
Boron	7440-42-8	ug/L	1.6	-	7310	38	38	338		7310		44.2		129		48.8		119		777		118		1630	
Calcium	7440-70-2	ug/L	116000	-	150000	38	5	56000		27400		36100		59100		38000		27700		60300		37700		139000	
Chromium	7440-47-3	ug/L	85	-	20.6	36	0	1.2	J	13.2				0.25	J	0.24	J	0.86	J	2.3		0.12	J	0.88	J
Cobalt	7440-48-4	ug/L	23	-	21.9	27	0	2.2		9.3						1.3									
Copper	7440-50-8	ug/L	9	B	10.8	20	1	1.9	J	1.9	J									4.3					
Cyanide	57-12-5	ug/L	5	-	26.6	4	2			3.5	J	NA		NA		NA		NA		NA		NA		NA	
Iron	7439-89-6	ug/L	300	-	81500	38	32	486		9300		33.1	J-	9050		2370		2850		15100		3060		20500	
Lead	7439-92-1	ug/L	2.5	B	183	27	14	1.6		2.9				1.4				2.7		5.1				1.7	
Magnesium	7439-95-4	ug/L	82000	-	124000	38	3	21600		41400		14200		17500		12700		9060		25800		17500		86200	
Manganese	7439-96-5	ug/L	120	-	5020	38	35	840		987		582		877		802		302		1120		605		1400	
Mercury	7439-97-6	ug/L	0.026	-	0.13	25	25			0.034	J	0.1	J	0.071	J	0.13	J	0.11	J	0.13	J	0.093	J	0.062	J
Nickel	7440-02-0	ug/L	52	B	48.3	38	0	6.4		33.3		1.4	J	1	J	1.3	J	0.78	J	1.8	J	1.4	J	3.2	J
Potassium	7440-09-7	ug/L	53000	-	169000	38	7	8480		169000		4860		8540		4190		5010		25800		6230		48500	
Selenium	7782-49-2	ug/L	1	B	24.1	20	14	1.6	J	11.6															
Sodium	7440-23-5	ug/L	700000	-	748000	38	3	88200		723000		42900	J	176000	J	36000	J	47200	J	748000	J	39600	J	319000	J
Vanadium	7440-62-2	ug/L	20	-	14	9	0			9.2															
Zinc	7440-66-6	ug/L	120	B	133	38	1	17.7	J	3.8	J	9.2		4.2		3.9		5.4		9.8		5.1		2.7	

NA = Not Analyzed

Blank Cell = Not Detected

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

The BTAG values in bold are expressed in terms of dissolved metals.

1 - Duplicate samples were not included in the summary statistics.

Table 4-21c
Total Metals and Dissolved Metals Detected in Pore Water (February 2016)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

LOCATION		**PW-0301**	**PW-0301**	**PW-0301**	**PW-0301**	**PW-0303**	**PW-0303**	**PW-1601**	**PW-1603**	**PW-1603**	**PW-1603**	**PW-1603**	**PW-2501**	**PW-2501**	**PW-2503**	**PW-2503**	**PW-LD103**
SAMPLE ID	**BTAG**	LDCA-PW-0301-00-0216	LDCA-PW-0301-02-0216	LDCA-PW-0301-02-0216-DUP	LDCA-PW-0301-04-0216	LDCA-PW-0303-00-0216	LDCA-PW-0303-02-0216	LDCA-PW-1601-00-0216	LDCA-PW-1603-00-0216-	LDCA-PW-1603-02-0216	LDCA-PW-1603-04-0216	LDCA-PW-1603-04-0216-DUP	LDCA-PW-2501-00-0216	LDCA-PW-2501-02-0216	LDCA-PW-2503-00-0216	LDCA-PW-2503-02-0216	LDCA-PW-LD103-00-0216
SAMPLE DATE		2/25/2016	2/25/2016	2/25/2016	2/25/2016	2/25/2016	2/25/2016	2/25/2016	2/26/2016	2/26/2016	2/26/2016	2/26/2016	2/25/2016	2/25/2016	2/26/2016	2/26/2016	2/26/2016
TOTAL METALS (UG/L)																	
ALUMINUM	87	384	120	52.3	11000	125	87.1	110	559	33.6			1870	554	248	35.5	139
ARSENIC	5				4.7			4.5	1.7			1.1	11.8	7	1.1		
BARIUM	4	186	183	187	380	109	161	218	134	119	165	166	433	499	228	130	69.8
CADMIUM	0.25				1.4								0.20				
CALCIUM	116000	60000	66300	66500	157000	42300	60200	85100	69000	65300	89400	88900	121000	139000	69400	50600	29800
CHROMIUM	85				37			13.8					17.1	11.5			
COBALT	23				9.2			4.7					6.8	6.7			
COPPER	9	8.9	4.3	2.8	68.9 J	8.6	8.9	30.7	5.5	3.2	3.3	2.2	57.6	54.5	6.1		6.4
IRON	300	40900	40300	40700	70300	250	16400	5700	33700	31900	51000	50700	28200	41900	76700	60400	245
LEAD	2.5	11.4	1.3		425	1.9	3.2	1.8	6.6	1.1			31.3	3.6	3		2.1
MAGNESIUM	82000	25900	28600	28300	89300	20100	26600	61900	22800	24500	44200	43800	74300	92300	25100	19900	10200
MANGANESE	120	3080	3300	3340	2080	8.9	776	282	4030	3540	4080	4050	522	2480	6930	3370	70.9
NICKEL	52	2.2	2	1.8	22.4	2.7	1.9	10.5	2.7	1.7	2.7	2.7	14.6	12.4	2.1	1.4	2
POTASSIUM	53000	5030	4970	4990	15600	4640	6150	101000	4810	4990	7480	7550	80900	84400	7010	4300	3420
SELENIUM	1																
SODIUM	700000	85600	48400	48200	98200	86400	97000	469000	33600	34100	38200	39100	422000	462000	39100	36400	59300
THALLIUM	0.8				0.20												
VANADIUM	20				31.5 J								14.6				
ZINC	120	13	5.2 J	2.5	327	23.1	3.9	6.6	10.8			5.5	74.5	6.4	10.4		16.8
DISSOLVED METALS (UG/L)																	
ARSENIC	5				1.2			3.7	1				7.7	7.3	1.1		
BARIUM	4	169	177	164	177	99.5	156	196	123	113	157	178	332	480	218	129	64.8
CADMIUM	0.25																
CALCIUM	116000	59100	66000	89000	147000	39500	58900	75500	69000	62400	88300	65100	105000	140000	68800	51300	29000
CHROMIUM	85							12.6 B					8.1 B	8.7 B			
COBALT	23				1			4.2					4.3	6.2			
COPPER	9	6.2	3.5	3	6.1	8.8	7.2	22.8	5.4	3.6	3.1	3.7	30.5	45.6	6	2.9	4.3
IRON	300	40100	40700	50200	51700		15600	4870	34200	31500	50000	40200	20500	40600	76100	61100	
MAGNESIUM	82000	25700	28300	44500	82700	18500	25900	53500	22900	24400	43900	27800	63400	94000	24600	20400	10100
MANGANESE	120	3100	3340	4020	1580	4.6	767	233	4210	3580	4020	3270	419	2330	6870	3410	61.5
NICKEL	52	1.3	1.5	2.5	4.1	2.2	1.5	8.8	1.5	1.5	2.6	1.5	9.7	9.9	1.5	1.1	1.8
POTASSIUM	53000	5060	5070	7830	13700	4410	6140	87500	4670	5130	7690	5010	70200	81300	6880	4480	3470
SELENIUM	1							2.1									
SODIUM	700000	89900	49300	42100	103000	83900	102000	436000	35600	35000	41100	48700	382000	476000	40600	37800	60600
VANADIUM	20							5.4 J					6.9 J				
ZINC	120				3	21		5.3	2.4				7.9		2.9		12.8

Notes:
Blank Cell = Not Detected
BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)
Highlighted values indicate their exceedances of BTAG benchmark.

Table 4-21c

Total Metals and Dissolved Metals Detected in Pore Water (February 2016)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

LOCATION		**PW-LD103**	**PW-LD103**	**PW-LD108**	**PW-LD108**	**PW-LD126**
SAMPLE ID	**BTAG**	LDCA-PW-LD103-02-0216	LDCA-PW-LD103-04-0216	LDCA-PW-LD108HT-00-0216	LDCA-PW-LD108-00-0216	LDCA-PW-LD126-00-0216
SAMPLE DATE		2/26/2016	2/26/2016	2/25/2016	2/26/2016	2/25/2016
TOTAL METALS (UG/L)						
ALUMINUM	87		26.8	1290	1310	613
ARSENIC	5			1.2	2.1	1.8
BARIUM	4	86.1	106	380	214	206
CADMIUM	0.25			0.30	0.20	
CALCIUM	116000	35300	63500	118000	84000	58500
CHROMIUM	85			2.1	5.1	
COBALT	23			2.5	1.7	2.6
COPPER	9	10.9	2.2	15.5	16.9	18.3
IRON	300		5740	2460	2970	12100
LEAD	2.5		1.4	3.5	18.5	10.2
MAGNESIUM	82000	13700	23900	52700	41400	28500
MANGANESE	120	10.4	813	180	191	1210
NICKEL	52	2	2	9.8	8.3	4.6
POTASSIUM	53000	5450	4630	29700	18800	7040
SELENIUM	1			1.1	1	
SODIUM	700000	145000	47700	64600	68500	129000
THALLIUM	0.8					
VANADIUM	20					
ZINC	120	9.6	2.6	32.3	37.1	54.7
DISSOLVED METALS (UG/L)						
ARSENIC	5					
BARIUM	4	90.7	107	296	181	186
CADMIUM	0.25			0.30		
CALCIUM	116000	35000	62900	101000	77000	56200
CHROMIUM	85					
COBALT	23			1.5		1.9
COPPER	9	12.1	2.9	12.9	10.6	10.5
IRON	300		5860	683	330	11100
MAGNESIUM	82000	13500	24100	44100	37800	27100
MANGANESE	120	12.3	845	157	162	1170
NICKEL	52	2	1.9	7.7	5	3.1
POTASSIUM	53000	5300	4780	26600	18900	6760
SELENIUM	1			1.1	1	
SODIUM	700000	148000	49500	58600	68600	134000
VANADIUM	20					
ZINC	120	10.2		21.4	10.1	28.3

Notes:

Blank Cell = Not Detected

BTAG = EPA Region III BTAG Fresh Water Screenir

Highlighted values indicate their exceedances of I

Semivolatile Organic Compounds (SVOCs) Detected in Pore Water (May 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			LD103		LD106		LD108		LD110		LD114		LD116		LD118		LD123		LD126		LD129		LD132	
					Maximum	Number of	Number of	5/2/2013		5/2/2013		5/2/2013		5/2/2013		5/3/2013		5/3/2013		5/3/2013		5/3/2013		5/2/2013		5/2/2013		5/2/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedance	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,4-Dioxane	123-91-1	ug/L	-	-	170	11	0	4.9	J	14	J	12	J	63	J	150	J	11	J	130	J	69	J	110	J	170	J	25	J
2-Methylphenol	95-48-7	ug/L	13	-	17	1	1																						
4-Methylphenol	106-44-5	ug/L	543	-	71	2	0																			9.3	J		
Anthracene	120-12-7	ug/L	0.012	B	2.8	1	1																						
Benzaldehyde	100-52-7	ug/L	-	-	24	3	0																	5.8	J	7.6	J		
Benzo(a)anthracene	56-55-3	ug/L	0.018	B	12	3	3							5.1	J											4.1	J		
Benzo(a)pyrene	50-32-8	ug/L	0.015	B	11	3	3							4.3	J											4	J		
Benzo(b)fluoranthene	205-99-2	ug/L	-	B	14	3	0							4.5	J											5.1	J		
Benzo(g,h,i)perylene	191-24-2	ug/L	-	B	9.8	3	0							3.3	J											3.7	J		
Benzo(k)fluoranthene	207-08-9	ug/L	-	B	11	3	0							3.9	J											3.7	J		
Bis(2-ethylhexyl)phthalate	117-81-7	ug/L	16	-	13	8	0			2.6	J			6.9	J	2.6	J	10	J					2.8	J	6.3	J	13	J
Caprolactam	105-60-2	ug/L	-	-	3.7	1	0																						
Carbazole	86-74-8	ug/L	-	-	4.4	1	0																						
Chrysene	218-01-9	ug/L	-	B	16	3	0							6.3	J											6.3	J		
Dibenzo(a,h)anthracene	53-70-3	ug/L	-	B	4.1	1	0																						
Di-n-butylphthalate	84-74-2	ug/L	19	-	2.5	1	0																						
Fluoranthene	206-44-0	ug/L	0.04	B	29	4	4							12	J									3.3	J	12	J		
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	-	B	9.3	3	0							3.2	J											3.2	J		
N-Nitrosodiphenylamine	86-30-6	ug/L	210	-	4.4	1	0									4.4	J												
Phenanthrene	85-01-8	ug/L	0.4	B	17	3	3							7.1	J											6.5	J		
Pyrene	129-00-0	ug/L	0.025	B	22	4	4							9.4	J									2.6	J	8.8	J		

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

1 - Duplicate samples were not included in the summary statistics.

Table 4-22a

Semivolatile Organic Compounds (SVOCs) Detected in Pore Water (May 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

Analyte	CAS #	Unit	BTAG	B	Summary Statistics[1]			LD136		LD136DUP	
					Maximum	Number of	Number of	5/2/2013		5/2/2013	
					Detection	Detections	Exceedance	Result	Flag	Result	Flag
1,4-Dioxane	123-91-1	ug/L	-	-	170	11	0				
2-Methylphenol	95-48-7	ug/L	13	-	17	1	1	17	J	8	J
4-Methylphenol	106-44-5	ug/L	543	-	71	2	0	71	J	2.9	J
Anthracene	120-12-7	ug/L	0.012	B	2.8	1	1	2.8	J		
Benzaldehyde	100-52-7	ug/L	-	-	24	3	0	24	J	5.5	J
Benzo(a)anthracene	56-55-3	ug/L	0.018	B	12	3	3	12	J		
Benzo(a)pyrene	50-32-8	ug/L	0.015	B	11	3	3	11	J		
Benzo(b)fluoranthene	205-99-2	ug/L	-	B	14	3	0	14	J		
Benzo(g,h,i)perylene	191-24-2	ug/L	-	B	9.8	3	0	9.8	J		
Benzo(k)fluoranthene	207-08-9	ug/L	-	B	11	3	0	11	J		
Bis(2-ethylhexyl)phthalate	117-81-7	ug/L	16	-	13	8	0	11	J	5.4	J
Caprolactam	105-60-2	ug/L	-	-	3.7	1	0	3.7	J	3.5	J
Carbazole	86-74-8	ug/L	-	-	4.4	1	0	4.4	J		
Chrysene	218-01-9	ug/L	-	B	16	3	0	16	J	2.8	J
Dibenzo(a,h)anthracene	53-70-3	ug/L	-	B	4.1	1	0	4.1	J		
Di-n-butylphthalate	84-74-2	ug/L	19	-	2.5	1	0	2.5	J		
Fluoranthene	206-44-0	ug/L	0.04	B	29	4	4	29	J	5.3	J
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	-	B	9.3	3	0	9.3	J		
N-Nitrosodiphenylamine	86-30-6	ug/L	210	-	4.4	1	0				
Phenanthrene	85-01-8	ug/L	0.4	B	17	3	3	17	J	2.5	J
Pyrene	129-00-0	ug/L	0.025	B	22	4	4	22	J	3.8	J

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

1 - Duplicate samples were not included in the summary statistics.

Table 4-22b

Semivolatile Organic Compounds Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			0301-00		0301-02		0301-02D		0302-00		0302-02		0303-00		0303-02		1001-00		1001-02		1001-02D		1001-04	
					Maximum	Number of	Number of	9/9/2013		9/9/2013		9/9/2013		9/9/2013		9/9/2013		9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,4-Dioxane	123-91-1	ug/L	-	-	180	21	0	0.59	J	8.9		9.6				7.8				4.5		0.54	J	11		5.2	J	51	
2-Methylnaphthalene	91-57-6	ug/L	4.7	-	0.24	14	0																	0.024	J			0.074	J
4-Methylphenol	106-44-5	ug/L	543	-	1.3	1	0																						
Acenaphthene	83-32-9	ug/L	5.8	B	0.23	12	0																	0.1				0.21	J
Acenaphthylene	208-96-8	ug/L	-	B	0.12	8	0																	0.04	J				
Anthracene	120-12-7	ug/L	0.012	B	2.5	11	11																	0.079	J				
Benzaldehyde	100-52-7	ug/L	-	-	3	3	0																						
Benzo(a)anthracene	56-55-3	ug/L	0.018	B	0.2	12	7																					0.069	J
Benzo(a)pyrene	50-32-8	ug/L	0.015	B	0.041	1	1																						
Benzo(b)fluoranthene	205-99-2	ug/L	-	B	0.034	2	0																						
Benzo(g,h,i)perylene	191-24-2	ug/L	-	B	0.0096	2	0																						
Benzo(k)fluoranthene	207-08-9	ug/L	-	B	0.013	3	0																						
Chrysene	218-01-9	ug/L	-	B	0.059	11	0																	0.032	J				
Dibenzo(a,h)anthracene	53-70-3	ug/L	-	B	5	1	0																	0.0095	J				
Fluoranthene	206-44-0	ug/L	0.04	B	0.46	9	6																					0.12	
Fluorene	86-73-7	ug/L	3	B	0.6	5	0																					0.23	J
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	-	B	0.0079	4	0																	0.0079	J				
Naphthalene	91-20-3	ug/L	1.1	-	0.88	7	0																						
Pentachlorophenol	87-86-5	ug/L	0.5	B	0.58	4	1																						
Phenanthrene	85-01-8	ug/L	0.4	B	1.9	10	2																						
Pyrene	129-00-0	ug/L	0.025	B	0.45	12	12																	0.071	J			0.23	

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

1 - Duplicate samples were not included in the summary statistics.

Table 4-22b

Semivolatile Organic Compounds Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			1002-00		1002-02		1002-04		1003-00		1003-02		1601-00		1601-02		1602-00		1602-02		1602-04		1603-00	
					Maximum	Number of	Number of	9/11/2013		9/11/2013		9/11/2013		9/10/2013		9/10/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/12/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,4-Dioxane	123-91-1	ug/L	-	-	180	21	0			2.1	J	37								20						170			
2-Methylnaphthalene	91-57-6	ug/L	4.7	-	0.24	14	0					0.047	J					0.0068	J	0.079	J					0.24			
4-Methylphenol	106-44-5	ug/L	543	-	1.3	1	0																						
Acenaphthene	83-32-9	ug/L	5.8	B	0.23	12	0	0.029	J	0.066	J	0.23						0.056	J					0.059	J				
Acenaphthylene	208-96-8	ug/L	-	B	0.12	8	0			0.013	J							0.0078	J							0.084	J		
Anthracene	120-12-7	ug/L	0.012	B	2.5	11	11	0.021	J																	2.5	J		
Benzaldehyde	100-52-7	ug/L	-	-	3	3	0																						
Benzo(a)anthracene	56-55-3	ug/L	0.018	B	0.2	12	7	0.0068	J	0.016	J									0.052	J			0.026	J				
Benzo(a)pyrene	50-32-8	ug/L	0.015	B	0.041	1	1																						
Benzo(b)fluoranthene	205-99-2	ug/L	-	B	0.034	2	0																						
Benzo(g,h,i)perylene	191-24-2	ug/L	-	B	0.0096	2	0					0.0065	J					0.0075	J										
Benzo(k)fluoranthene	207-08-9	ug/L	-	B	0.013	3	0																						
Chrysene	218-01-9	ug/L	-	B	0.059	11	0	0.0065	J			0.018	J					0.015	J	0.025	J			0.019	J	0.059	J		
Dibenzo(a,h)anthracene	53-70-3	ug/L	-	B	5	1	0																			5	R		
Fluoranthene	206-44-0	ug/L	0.04	B	0.46	9	6													0.078	J	0.011	J	0.086	J			0.027	J
Fluorene	86-73-7	ug/L	3	B	0.6	5	0					0.19														0.12	J		
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	-	B	0.0079	4	0					0.0071	J																
Naphthalene	91-20-3	ug/L	1.1	-	0.88	7	0																			0.88			
Pentachlorophenol	87-86-5	ug/L	0.5	B	0.58	4	1			0.2	R	0.056	J					0.2	R	0.2	R							0.2	R
Phenanthrene	85-01-8	ug/L	0.4	B	1.9	10	2			0.045	J											0.0073	J					0.0081	J
Pyrene	129-00-0	ug/L	0.025	B	0.45	12	12	0.061	J	0.044	J							0.084	J	0.095	J			0.11		0.45		0.056	J

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

1 - Duplicate samples were not included in the summary statistics.

Semivolatile Organic Compounds Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			1603-00DUP		1603-02		1603-04		1603-04DUP		1802-00		1802-02		1803-00		2501-00		2501-02		2502-00	
					Maximum	Number of	Number of	9/12/2013		9/12/2013		9/12/2013		9/12/2013		9/13/2013		9/13/2013		9/13/2013		9/12/2013		9/12/2013		9/12/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,4-Dioxane	123-91-1	ug/L	-	-	180	21	0			32		180		160								70		89		31	
2-Methylnaphthalene	91-57-6	ug/L	4.7	-	0.24	14	0			0.055	J					0.0069	J	0.0081	J	0.01	J	0.062	J	0.048	J	0.058	J
4-Methylphenol	106-44-5	ug/L	543	-	1.3	1	0																			1.3	J
Acenaphthene	83-32-9	ug/L	5.8	B	0.23	12	0					0.1	J	0.11	J									0.18		0.047	J
Acenaphthylene	208-96-8	ug/L	-	B	0.12	8	0			0.035	J															0.058	J
Anthracene	120-12-7	ug/L	0.012	B	2.5	11	11			0.36		2.5	J	2.4	J			0.021	J			0.45		0.55		0.16	
Benzaldehyde	100-52-7	ug/L	-	-	3	3	0					3	J	2.1	J									2.6	J		
Benzo(a)anthracene	56-55-3	ug/L	0.018	B	0.2	12	7			0.084	J					0.012	J	0.017	J	0.01	J	0.1		0.11			
Benzo(a)pyrene	50-32-8	ug/L	0.015	B	0.041	1	1							0.041	J												
Benzo(b)fluoranthene	205-99-2	ug/L	-	B	0.034	2	0													0.017	J						
Benzo(g,h,i)perylene	191-24-2	ug/L	-	B	0.0096	2	0							0.0096	J												
Benzo(k)fluoranthene	207-08-9	ug/L	-	B	0.013	3	0													0.0055	J	0.0061	J				
Chrysene	218-01-9	ug/L	-	B	0.059	11	0			0.029	J	0.033	J	0.022	J			0.019	J	0.017	J						
Dibenzo(a,h)anthracene	53-70-3	ug/L	-	B	5	1	0																				
Fluoranthene	206-44-0	ug/L	0.04	B	0.46	9	6			0.12				0.46	J					0.03	J						
Fluorene	86-73-7	ug/L	3	B	0.6	5	0					0.09	J											0.6			
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	-	B	0.0079	4	0					0.0075	J									0.0052	J				
Naphthalene	91-20-3	ug/L	1.1	-	0.88	7	0			0.12		0.67				0.023	J	0.028	J	0.015	J	0.11					
Pentachlorophenol	87-86-5	ug/L	0.5	B	0.58	4	1							0.2	R	0.11	J									0.042	J
Phenanthrene	85-01-8	ug/L	0.4	B	1.9	10	2			0.022	J	1.5	J	1.9		0.018	J					0.04	J	0.081	J		
Pyrene	129-00-0	ug/L	0.025	B	0.45	12	12	0.029	J	0.14																0.073	J

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

1 - Duplicate samples were not included in the summary statistics.

Table 4-22b

Semivolatile Organic Compounds Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			2502-02		2503-00		2503-02		3301-00		3301-02		3302-00		3302-02		3302-04		3303-00		3303-02	
					Maximum	Number of	Number of	9/12/2013		9/12/2013		9/12/2013		9/10/2013		9/10/2013		9/10/2013		9/10/2013		9/10/2013		9/10/2013		9/10/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,4-Dioxane	123-91-1	ug/L	-	-	180	21	0	100		3.4		63										0.15	J			0.23	J
2-Methylnaphthalene	91-57-6	ug/L	4.7	-	0.24	14	0					0.065	J														
4-Methylphenol	106-44-5	ug/L	543	-	1.3	1	0																				
Acenaphthene	83-32-9	ug/L	5.8	B	0.23	12	0			0.018	J	0.15															
Acenaphthylene	208-96-8	ug/L	-	B	0.12	8	0			0.0087	J	0.12															
Anthracene	120-12-7	ug/L	0.012	B	2.5	11	11	0.7				1.8	J														
Benzaldehyde	100-52-7	ug/L	-	-	3	3	0	1.9	J																		
Benzo(a)anthracene	56-55-3	ug/L	0.018	B	0.2	12	7	0.2																			
Benzo(a)pyrene	50-32-8	ug/L	0.015	B	0.041	1	1	0.017	J																		
Benzo(b)fluoranthene	205-99-2	ug/L	-	B	0.034	2	0	0.034	J																		
Benzo(g,h,i)perylene	191-24-2	ug/L	-	B	0.0096	2	0																				
Benzo(k)fluoranthene	207-08-9	ug/L	-	B	0.013	3	0	0.013	J																		
Chrysene	218-01-9	ug/L	-	B	0.059	11	0																				
Dibenzo(a,h)anthracene	53-70-3	ug/L	-	B	5	1	0																				
Fluoranthene	206-44-0	ug/L	0.04	B	0.46	9	6	0.1				0.11															
Fluorene	86-73-7	ug/L	3	B	0.6	5	0																				
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	-	B	0.0079	4	0																				
Naphthalene	91-20-3	ug/L	1.1	-	0.88	7	0																				
Pentachlorophenol	87-86-5	ug/L	0.5	B	0.58	4	1	0.58	J																		
Phenanthrene	85-01-8	ug/L	0.4	B	1.9	10	2	1.2	J			0.31															
Pyrene	129-00-0	ug/L	0.025	B	0.45	12	12					0.15															

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

1 - Duplicate samples were not included in the summary statistics.

Table 4-22c

Polycyclic Aromatic Hydrocarbons (PAHs) Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			0301-00		0301-02		0301-02D		0302-00		0302-02		0303-00		0303-02		1001-00		1001-02D		1003-00		1003-02		3301-00		3301-02	
					Maximum	Number of	Number of	9/9/2013		9/9/2013		9/9/2013		9/9/2013		9/9/2013		9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/10/2013		9/10/2013		9/10/2013		9/10/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
2-Methylnaphthalene	91-57-6	ug/L	4.7	-	0.035	14	0	0.017	J	0.01	J	0.012	J	0.012	J	0.035	J	0.0056	J	0.018	J	0.017	J	0.014	J			0.013	J			0.0072	J
Acenaphthene	83-32-9	ug/L	5.8	B	0.48	14	0	0.033	J	0.094	J	0.1		0.028	J	0.11		0.01	J	0.11		0.031	J	0.088	J			0.062	J			0.022	J
Acenaphthylene	208-96-8	ug/L	-	B	0.028	10	0	0.012	J	0.021	J	0.024	J			0.018	J			0.011	J			0.028	J			0.0075	J				
Anthracene	120-12-7	ug/L	0.012	B	0.15	12	11	0.077	J	0.098		0.11		0.011	J	0.15				0.091	J	0.018	J	0.07	J			0.036	J			0.023	J
Benzo(a)anthracene	56-55-3	ug/L	0.018	B	0.09	10	6			0.038	J					0.09	J	0.018	J	0.086	J							0.04	J			0.013	J
Benzo(a)pyrene	50-32-8	ug/L	0.015	B	0.052	5	5									0.035	J			0.052	J							0.031	J				
Benzo(b)fluoranthene	205-99-2	ug/L	-	B	0.073	7	0									0.054	J	0.028	J	0.073	J							0.054	J			0.0095	J
Benzo(g,h,i)perylene	191-24-2	ug/L	-	B	0.032	6	0									0.018	J	0.013	J	0.032	J							0.023	J				
Benzo(k)fluoranthene	207-08-9	ug/L	-	B	0.024	6	0									0.021	J	0.011	J	0.024	J							0.021	J				
Chrysene	218-01-9	ug/L	-	B	0.076	10	0			0.043	J					0.076	J	0.019	J	0.067	J							0.034	J			0.011	J
Dibenzo(a,h)anthracene	53-70-3	ug/L	-	B	0.0072	3	0													0.0072	J												
Fluoranthene	206-44-0	ug/L	0.04	B	0.17	16	9	0.037	J	0.052	J	0.04	J	0.03	J	0.16		0.047	J	0.17		0.027	J	0.044	J	0.021	J	0.12		0.021	J	0.061	J
Fluorene	86-73-7	ug/L	3	B	0.071	5	0	0.035	J							0.071	J			0.043	J	0.024	J	0.041	J			0.06	J				
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	-	B	0.031	6	0									0.019	J	0.011	J	0.031	J							0.022	J				
Naphthalene	91-20-3	ug/L	1.1	-	0.094	16	0	0.046	J	0.015	J	0.016	J	0.044	J	0.094	J	0.022	J	0.065	J	0.034	J	0.017	J	0.022	J	0.058	J	0.018	J	0.028	J
Pentachlorophenol	87-86-5	ug/L	0.5	B	0.2	4	0	0.11	J	0.2	R	0.2	R	0.041	J	0.2	R	0.2	R	0.2	R	0.064	J	0.2	R	0.2	R	0.13	J	0.2	R	0.2	R
Phenanthrene	85-01-8	ug/L	0.4	B	0.23	16	0	0.045	J	0.073	J	0.098		0.032	J	0.23		0.018	J	0.18		0.033	J	0.1		0.019	J	0.073	J	0.014	J	0.047	J
Pyrene	129-00-0	ug/L	0.025	B	0.21	16	15	0.032	J	0.098		0.092	J	0.053	J	0.21		0.043	J	0.21		0.045	J	0.034	J	0.051	J	0.12		0.049	J	0.076	J

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

1 - Duplicate samples were not included in the summary statistics.

Table 4-22c

Polycyclic Aromatic Hydrocarbons (PAHs) Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			3302-00		3302-02		3302-04		3303-00		3303-02	
					Maximum	Number of	Number of	9/10/2013		9/10/2013		9/10/2013		9/10/2013		9/10/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
2-Methylnaphthalene	91-57-6	ug/L	4.7	-	0.035	14	0	0.0085	J	0.0052	J	0.016	J	0.0069	J	0.006	J
Acenaphthene	83-32-9	ug/L	5.8	B	0.48	14	0	0.026	J	0.13		0.24		0.028	J	0.48	
Acenaphthylene	208-96-8	ug/L	-	B	0.028	10	0	0.0051	J	0.01	J	0.016	J	0.0058	J	0.012	J
Anthracene	120-12-7	ug/L	0.012	B	0.15	12	11			0.028	J	0.041	J	0.02	J	0.064	J
Benzo(a)anthracene	56-55-3	ug/L	0.018	B	0.09	10	6	0.0055	J	0.07	J	0.08	J			0.0081	J
Benzo(a)pyrene	50-32-8	ug/L	0.015	B	0.052	5	5			0.04	J	0.045	J				
Benzo(b)fluoranthene	205-99-2	ug/L	-	B	0.073	7	0			0.055	J	0.066	J				
Benzo(g,h,i)perylene	191-24-2	ug/L	-	B	0.032	6	0			0.019	J	0.026	J				
Benzo(k)fluoranthene	207-08-9	ug/L	-	B	0.024	6	0			0.021	J	0.019	J				
Chrysene	218-01-9	ug/L	-	B	0.076	10	0	0.0057	J	0.056	J	0.063	J			0.0059	J
Dibenzo(a,h)anthracene	53-70-3	ug/L	-	B	0.0072	3	0			0.0063	J	0.007	J				
Fluoranthene	206-44-0	ug/L	0.04	B	0.17	16	9	0.029	J	0.11		0.12		0.035	J	0.055	J
Fluorene	86-73-7	ug/L	3	B	0.071	5	0										
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	-	B	0.031	6	0			0.019	J	0.026	J				
Naphthalene	91-20-3	ug/L	1.1	-	0.094	16	0	0.036	J	0.02	J	0.032	J	0.014	J	0.016	J
Pentachlorophenol	87-86-5	ug/L	0.5	B	0.2	4	0	0.2	R	0.2	R	0.2	R	0.2	R	0.2	R
Phenanthrene	85-01-8	ug/L	0.4	B	0.23	16	0	0.028	J	0.034	J	0.089	J	0.015	J	0.09	J
Pyrene	129-00-0	ug/L	0.025	B	0.21	16	15	0.024	J	0.16		0.18		0.03	J	0.093	J

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

1 - Duplicate samples were not included in the summary statistics.

Table 4-23a

Pesticides Detected in Pore Water (May 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			LD103		LD106		LD108		LD110		LD114		LD116		LD118		LD123		LD126		LD129	
					Maximum	Number of	Number of	5/2/2013		5/2/2013		5/2/2013		5/2/2013		5/3/2013		5/3/2013		5/3/2013		5/3/2013		5/2/2013		5/2/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	ug/L	0.011	B	0.057	2	2							0.057	J												
4,4'-DDE	72-55-9	ug/L	-	B	0.037	4	0							0.037	J							0.0019	J	0.013	J		
4,4'-DDT	50-29-3	ug/L	0.0005	B	0.12	3	3							0.12	J									0.016	J		
alpha-Chlordane	5103-71-9	ug/L	0.0022	-	0.39	4	4							0.029	J									0.063	J	0.0052	J
Dieldrin	60-57-1	ug/L	0.056	B	0.0082	1	0							0.0082	J												
Endosulfan II	33213-65-9	ug/L	0.051	B	0.01	1	0							0.01	J												
Endrin aldehyde	7421-93-4	ug/L	-	-	0.036	3	0							0.036	J									0.0025	J		
Endrin ketone	53494-70-5	ug/L	-	-	0.017	1	0							0.017	J												
gamma-BHC (Lindane)	58-89-9	ug/L	0.01	B	0.021	1	1															0.021	J				
gamma-Chlordane	5103-74-2	ug/L	0.0022	-	0.2	2	2																	0.031	J		
Heptachlor epoxide	1024-57-3	ug/L	0.0019	B	0.022	2	2																	0.0045	J		

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

1 - Duplicate samples were not included in the summary statistics.

Table 4-23a

Pesticides Detected in Pore Water (May 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

Analyte	CAS #	Unit	BTAG	B	LD132		LD136		LD136DUP	
					5/2/2013		5/2/2013		5/2/2013	
					Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	ug/L	0.011	B			0.054	J	0.052	J
4,4'-DDE	72-55-9	ug/L	-	B			0.031	J	0.05	J
4,4'-DDT	50-29-3	ug/L	0.0005	B			0.039	J	0.064	J
alpha-Chlordane	5103-71-9	ug/L	0.0022	-			0.39	J	0.4	J
Dieldrin	60-57-1	ug/L	0.056	B						
Endosulfan II	33213-65-9	ug/L	0.051	B						
Endrin aldehyde	7421-93-4	ug/L	-	-			0.031	J	0.011	J
Endrin ketone	53494-70-5	ug/L	-	-						
gamma-BHC (Lindane)	58-89-9	ug/L	0.01	B						
gamma-Chlordane	5103-74-2	ug/L	0.0022	-			0.2	J	0.16	J
Heptachlor epoxide	1024-57-3	ug/L	0.0019	B			0.022	J		

BTAG = EPA Region III BTAG Fresh Water Screening Bencl

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG be

1 - Duplicate samples were not included in the summary

Table 4-23b

Pesticides Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			0301-00		0301-02		0301-02DUP		0302-00		0302-02		0303-00		0303-02		1001-00		1001-02		1001-02DUP	
					Maximum	Number of	Number of	9/9/2013		9/9/2013		9/9/2013		9/9/2013		9/9/2013		9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/11/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	ug/L	0.011	B	0.0028	1	0																				
4,4'-DDE	72-55-9	ug/L	-	B	0.0034	7	0																				
4,4'-DDT	50-29-3	ug/L	0.0005	B	0.018	31	31							0.011		0.0026	J	0.0089	J	0.0022	J	0.0092	J				
Aldrin	309-00-2	ug/L	3	B	0.0042	4	0																				
alpha-BHC[2]	319-84-6	ug/L	0.01	B	0.0028	7	0																				
alpha-Chlordane	5103-71-9	ug/L	0.0022	-	0.0035	18	14							0.0019	J							0.0023	J	0.0022	J		
beta-BHC[2]	319-85-7	ug/L	0.01	B	0.011	9	1																	0.0039	J		
delta-BHC	319-86-8	ug/L	141	B	0.0066	9	0	0.001	J															0.005	J	0.0053	
Dieldrin	60-57-1	ug/L	0.056	B	0.02	36	0	0.0099		0.0057	J	0.0052	J	0.012		0.0094		0.0096		0.0047		0.013		0.0074	J	0.0079	J
Endosulfan I	959-98-8	ug/L	0.051	B	0.0043	11	0	0.001	J	0.001	J																
Endosulfan II	33213-65-9	ug/L	0.051	B	0.0048	25	0	0.0045	J					0.0037	J			0.0024	J	0.0031	J	0.0024	J				
Endrin	72-20-8	ug/L	0.036	B	0.003	6	0																				
Endrin aldehyde	7421-93-4	ug/L	-	-	0.0049	15	0	0.0013	J											0.0024	J						
Endrin ketone	53494-70-5	ug/L	-	-	0.0029	8	0																				
gamma-BHC (Lindane)	58-89-9	ug/L	0.01	B	0.0026	4	0																				
gamma-Chlordane	5103-74-2	ug/L	0.0022	-	0.007	19	10							0.0015	J	0.0016	J					0.0013	J				
Heptachlor	76-44-8	ug/L	0.0019	B	0.0063	10	5	0.001	J																		
Heptachlor epoxide	1024-57-3	ug/L	0.0019	B	0.0026	11	9							0.0022	J												
Methoxychlor	72-43-5	ug/L	0.019	B	0.0082	4	0																				

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

1 - Duplicate samples were not included in the summary statistics.

2 - Used gamma-BHC benchmarlk as a surrogate.

Table 4-23b

Pesticides Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					1001-04		1002-00		1002-02		1002-04		1003-00		1003-02		1601-00		1601-02		1602-00		1602-02		1602-04		1603-00		1603-00DUP	
					9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/10/2013		9/10/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/12/2013		9/12/2013	
Analyte	CAS #	Unit	BTAG	B	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	ug/L	0.011	B															0.0028	J										
4,4'-DDE	72-55-9	ug/L	-	B	0.0034	J					0.0012	J													0.0013	J	0.0011	J		
4,4'-DDT	50-29-3	ug/L	0.0005	B	0.002	J	0.013	J					0.01		0.011		0.015	J	0.0053	J	0.0097	J	0.003	J	0.0041	J	0.0067	J	0.0021	J
Aldrin	309-00-2	ug/L	3	B	0.0013	J					0.0021	J																		
alpha-BHC(2)	319-84-6	ug/L	0.01	B	0.0016	J													0.0015						0.0019	J				
alpha-Chlordane	5103-71-9	ug/L	0.0022	-			0.0023	J	0.0019	J			0.0021	J	0.002	J	0.0035	J			0.0024	J	0.0022	J	0.0027	J			0.0022	J
beta-BHC(2)	319-85-7	ug/L	0.01	B	0.0023	J					0.0035	J	0.0027						0.0031	J					0.0026	J				
delta-BHC	319-86-8	ug/L	141	B	0.0066	J					0.0042	J																		
Dieldrin	60-57-1	ug/L	0.056	B	0.0042	J	0.016		0.0097		0.0058	J	0.014		0.011		0.02		0.0034	J	0.017		0.0073				0.011		0.012	
Endosulfan I	959-98-8	ug/L	0.051	B	0.0017	J					0.0021	J					0.0013	J							0.0025	J				
Endosulfan II	33213-65-9	ug/L	0.051	B	0.0026	J	0.0036	J					0.0048	J			0.0047	J	0.0019	J	0.0027	J	0.0034	J			0.0022	J	0.0022	J
Endrin	72-20-8	ug/L	0.036	B							0.0021	J													0.0014	J				
Endrin aldehyde	7421-93-4	ug/L	-	-	0.0031	J			0.0019	J	0.0022	J													0.0049	J	0.0018	J	0.0012	J
Endrin ketone	53494-70-5	ug/L	-	-													0.0017	J			0.0028	J					0.0017	J	0.0021	J
gamma-BHC (Lindane)	58-89-9	ug/L	0.01	B	0.0015	J					0.0015	J													0.0015	J				
gamma-Chlordane	5103-74-2	ug/L	0.0022	-			0.0013	J			0.0018	J	0.0012	J	0.0014	J	0.0025	J	0.0041	J			0.0019	J	0.0023	J				
Heptachlor	76-44-8	ug/L	0.0019	B													0.0011	J	0.0036						0.0039					
Heptachlor epoxide	1024-57-3	ug/L	0.0019	B			0.0021						0.0021	J							0.0026	J							0.0018	J
Methoxychlor	72-43-5	ug/L	0.019	B															0.0061	J					0.0055	J				

BTAG = EPA Region III BTAG Fresh Water Screening Bencl

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG be

1 - Duplicate samples were not included in the summary

2 - Used gamma-BHC benchmarlk as a surrogate.

Table 4-23b

Pesticides Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					1603-02		1603-04		1603-04DUP		1802-00		1802-02		1803-00		2501-00		2501-02		2502-00		2502-02		2503-00		2503-02		3301-00	
					9/12/2013		9/12/2013		9/12/2013		9/13/2013		9/13/2013		9/13/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013		9/10/2013	
Analyte	CAS #	Unit	BTAG	B	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	ug/L	0.011	B																										
4,4'-DDE	72-55-9	ug/L	-	B			0.0022	J											0.0013	J							0.0022	J		
4,4'-DDT	50-29-3	ug/L	0.0005	B	0.0073	J	0.018	J	0.012	J	0.0021	J	0.0016	J	0.0047	J	0.012	J	0.0051	J	0.013	J	0.0043	J	0.0084	J	0.0076		0.01	
Aldrin	309-00-2	ug/L	3	B															0.0031	J							0.0042	J		
alpha-BHC(2)	319-84-6	ug/L	0.01	B													0.0012	J	0.0028	J			0.0013	J			0.0011	J		
alpha-Chlordane	5103-71-9	ug/L	0.0022	-					0.0019	J	0.0027	J	0.0016	J	0.0024	J					0.0019	J			0.0018	J			0.002	J
beta-BHC(2)	319-85-7	ug/L	0.01	B			0.0043	J											0.0025	J			0.011	J						
delta-BHC	319-86-8	ug/L	141	B													0.0016	J	0.0018	J	0.001	J	0.0035	J			0.0019	J		
Dieldrin	60-57-1	ug/L	0.056	B	0.0052						0.014	J	0.0066		0.017	J	0.012	J	0.013	J	0.015		0.016		0.012		0.012		0.014	
Endosulfan I	959-98-8	ug/L	0.051	B			0.0011	J	0.0011	J							0.0022	J	0.0043	J			0.0038	J			0.0025	J		
Endosulfan II	33213-65-9	ug/L	0.051	B							0.0031	J	0.0019	J	0.0022	J	0.0028	J	0.0024	J	0.0036	J	0.0027	J	0.0026	J	0.0026	J	0.0043	J
Endrin	72-20-8	ug/L	0.036	B													0.0017	J					0.0018	J						
Endrin aldehyde	7421-93-4	ug/L	-	-	0.0014	J	0.0022	J							0.0012	J			0.0032	J	0.0015	J	0.0025	J			0.0023	J		
Endrin ketone	53494-70-5	ug/L	-	-							0.0019	J	0.0016	J	0.0029	J	0.0018	J							0.0016	J				
gamma-BHC (Lindane)	58-89-9	ug/L	0.01	B																							0.0026	J		
gamma-Chlordane	5103-74-2	ug/L	0.0022	-			0.007	J			0.0021	J					0.0028	J	0.0028	J			0.0055	J	0.0011	J	0.0068			
Heptachlor	76-44-8	ug/L	0.0019	B	0.0015		0.0063	J	0.004	J									0.0019	J			0.0032	J			0.0027	J		
Heptachlor epoxide	1024-57-3	ug/L	0.0019	B							0.0021				0.0023		0.0018	J			0.0021	J			0.0019	J	0.0026	J	0.002	J
Methoxychlor	72-43-5	ug/L	0.019	B													0.0055	J	0.0082	J										

BTAG = EPA Region III BTAG Fresh Water Screening Bencl

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG be

1 - Duplicate samples were not included in the summary

2 - Used gamma-BHC benchmarlk as a surrogate.

Table 4-23b

Pesticides Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					3301-02		3302-00		3302-02		3302-04		3303-00		3303-02	
					9/10/2013		9/10/2013		9/10/2013		9/10/2013		9/10/2013		9/10/2013	
Analyte	CAS #	Unit	BTAG	B	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	ug/L	0.011	B												
4,4'-DDE	72-55-9	ug/L	-	B												
4,4'-DDT	50-29-3	ug/L	0.0005	B	0.0014	J	0.0072	J			0.0016	J	0.0083	J		
Aldrin	309-00-2	ug/L	3	B												
alpha-BHC(2)	319-84-6	ug/L	0.01	B												
alpha-Chlordane	5103-71-9	ug/L	0.0022	-					0.0026	J						
beta-BHC(2)	319-85-7	ug/L	0.01	B												
delta-BHC	319-86-8	ug/L	141	B												
Dieldrin	60-57-1	ug/L	0.056	B	0.008		0.012	J	0.0094		0.0023	J	0.012		0.0045	
Endosulfan I	959-98-8	ug/L	0.051	B												
Endosulfan II	33213-65-9	ug/L	0.051	B			0.0025	J					0.0032	J		
Endrin	72-20-8	ug/L	0.036	B			0.0016	J					0.003	J		
Endrin aldehyde	7421-93-4	ug/L	-	-									0.0027	J		
Endrin ketone	53494-70-5	ug/L	-	-												
gamma-BHC (Lindane)	58-89-9	ug/L	0.01	B												
gamma-Chlordane	5103-74-2	ug/L	0.0022	-					0.0021	J						
Heptachlor	76-44-8	ug/L	0.0019	B							0.0012					
Heptachlor epoxide	1024-57-3	ug/L	0.0019	B												
Methoxychlor	72-43-5	ug/L	0.019	B												

BTAG = EPA Region III BTAG Fresh Water Screening Bencl

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG be

1 - Duplicate samples were not included in the summary

2 - Used gamma-BHC benchmarlk as a surrogate.

Table 4-24a

Polychlorinated Biphenyls (PCBs) Detected in Pore Water (May 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

Analyte	CAS #	Unit	BTAG	B	Summary Statistics[1]			LD126		LD129		LD132		LD132DUP		LD136	
					Maximum	Number of	Number of	5/2/2013		5/2/2013		5/2/2013		5/2/2013		5/2/2013	
					Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-1	2051-60-7	pg/L	-	-	30700	4	NA	7490		5660		30700	J	19800	J	50.1	
PCB-10	33146-45-1	pg/L	-	-	3910	3	NA	561		285		3910		2020			
PCB-104	56558-16-8	pg/L	-	-	73	2	NA	73				69.3	J	83	J		
PCB-105	32598-14-4	pg/L	-	-	32100	4	NA	2980		146		32100	J	502	J	295	
PCB-107/124	70424-68-9/70424-70-3	pg/L	-	-	3210	3	NA			18.1	J	3210		52.8		37	J
PCB-109	74472-35-8	pg/L	-	-	3900	3	NA			20.5		3900				53.1	
PCB-11	2050-67-1	pg/L	-	-	1210	4	NA	1210		207		163		136		196	
PCB-110/115	38380-03-9/74472-38-1	pg/L	-	-	103000	3	NA			707		103000	J	2870		1440	
PCB-114	74472-37-0	pg/L	-	-	1610	3	NA			7.2	J	1610	J	17.2	J	13.6	J
PCB-118	31508-00-6	pg/L	-	-	80900	4	NA	9810		335		80900	J	1480	J	764	
PCB-12/13	2974-92-7/2974-90-5	pg/L	-	-	1220	3	NA	1220		94.9		256		151			
PCB-123	65510-44-3	pg/L	-	-	494	2	NA			9.6	J	494		116	J		
PCB-126	57465-28-8	pg/L	-	-	53.1	3	NA	45.2				53.1		6.5	J	8.6	J
PCB-128/166	38380-07-3/41411-63-6	pg/L	-	-	17700	4	NA	3070		153		17700		621		357	
PCB-129/138/160/163	55215-18-4/35065-28-2/41411-62-5/74472-44-9	pg/L	-	-	98400	4	NA	32500		1600		98400	J	7190		3480	
PCB-130	52663-66-8	pg/L	-	-	5350	3	NA			71.3		5350		270		138	
PCB-131	61798-70-7	pg/L	-	-	1410	1	NA					1410					
PCB-132	38380-05-1	pg/L	-	-	31300	3	NA			477		31300		2190		1030	
PCB-133	35694-04-3	pg/L	-	-	786	3	NA			19.8	J	786		104		31.6	
PCB-134/143	52704-70-8/68194-15-0	pg/L	-	-	4150	4	NA	908		59.7		4150		263		120	
PCB-135/151/154	52744-13-5/52663-63-5/60145-22-4	pg/L	-	-	18100	4	NA	18100		617		17500		3140		1130	
PCB-136	38411-22-2	pg/L	-	-	8020	2	NA			188		8020		1130			
PCB-137	35694-06-5	pg/L	-	-	5950	3	NA			165		5950				361	
PCB-139/140	56030-56-9/59291-64-4	pg/L	-	-	1710	1	NA					1710					
PCB-141	52712-04-6	pg/L	-	-	12800	4	NA	4390		352		12800		1500		745	
PCB-144	68194-14-9	pg/L	-	-	2430	3	NA			75.2		2430		409		134	
PCB-145	74472-40-5	pg/L	-	-	6070	1	NA	6070									
PCB-146	51908-16-8	pg/L	-	-	8560	3	NA			193		8560		967		380	
PCB-147/149	68194-13-8/38380-04-0	pg/L	-	-	54400	4	NA	34200		1430		54400	J	7380		2870	
PCB-148	74472-41-6	pg/L	-	-	275	1	NA	275									
PCB-15	2050-68-2	pg/L	-	-	3410	4	NA	3410		599		453	J	301	J	111	
PCB-150	68194-08-1	pg/L	-	-	104	1	NA					104		35.4			
PCB-152	68194-09-2	pg/L	-	-	84.9	1	NA					84.9		25.2			
PCB-153/168	35065-27-1/59291-65-5	pg/L	-	-	62000	4	NA	32100		1420		62000	J	6790		3100	
PCB-156/157	38380-08-4/69782-90-7	pg/L	-	-	12200	4	NA	2210		102		12200	J	457	J	228	
PCB-158	74472-42-7	pg/L	-	-	10500	4	NA	2290		126		10500		570		294	

Table 4-24a

Polychlorinated Biphenyls (PCBs) Detected in Pore Water (May 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			LD126		LD129		LD132		LD132DUP		LD136	
					Maximum	Number of	Number of	5/2/2013		5/2/2013		5/2/2013		5/2/2013		5/2/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-159	39635-35-3	pg/L	-	-	271	3	NA	271				164		51.6		27.3	
PCB-16	38444-78-9	pg/L	-	-	286	1	NA							1700		286	
PCB-161	74472-43-8	pg/L	-	-	4370	1	NA	4370									
PCB-162	39635-34-2	pg/L	-	-	389	2	NA	204				389					
PCB-164	74472-45-0	pg/L	-	-	6160	4	NA	5130		125		6160				280	
PCB-167	52663-72-6	pg/L	-	-	3710	4	NA	820		43.3		3710	J	155	J	87	
PCB-169	32774-16-6	pg/L	-	-	39.7	1	NA					39.7					
PCB-17	37680-66-3	pg/L	-	-	6700	4	NA	6700		1750		6420		3900		211	
PCB-170	35065-30-6	pg/L	-	-	10200	4	NA	10200		558		8720		1880		1120	
PCB-171/173	52663-71-5/68194-16-1	pg/L	-	-	2870	4	NA	2030		185		2870		658		352	
PCB-172	52663-74-8	pg/L	-	-	3930	4	NA	3930		100		1300		329		204	
PCB-174	38411-25-5	pg/L	-	-	12200	4	NA	12200		609		8330		2240		1350	
PCB-175	40186-70-7	pg/L	-	-	303	1	NA					303					
PCB-176	52663-65-7	pg/L	-	-	1270	4	NA	1270		71.1		756		279		145	
PCB-177	52663-70-4	pg/L	-	-	6830	4	NA	6830		384		4550		1330		671	
PCB-178	52663-67-9	pg/L	-	-	2080	4	NA	2080		120		1160		461		215	
PCB-179	52663-64-6	pg/L	-	-	5560	3	NA	5560		238				1010		464	
PCB-18/30	37680-65-2/35693-92-6	pg/L	-	-	10300	4	NA	10300		4780		9000		5310		478	
PCB-180/193	35065-29-3/69782-91-8	pg/L	-	-	25300	4	NA	25300		1270		16000		4670		2650	
PCB-183/185	52663-69-1/52712-05-7	pg/L	-	-	9690	4	NA	9690		351		5350		1380		785	
PCB-187	52663-68-0	pg/L	-	-	16900	4	NA	16900		767		8540		3180		1450	
PCB-189	39635-31-9	pg/L	-	-	380	4	NA	380		24		331	J	83.6	J	36.6	
PCB-19	38444-73-4	pg/L	-	-	21000	4	NA	5780		1260		21000	J	14000	J	79.3	
PCB-190	41411-64-7	pg/L	-	-	2140	4	NA	2140		121		1440		375		230	
PCB-191	74472-50-7	pg/L	-	-	531	4	NA	531		22.6		303		75.9		38	
PCB-194	35694-08-7	pg/L	-	-	7590	4	NA	7590		307		1870		817		562	
PCB-195	52663-78-2	pg/L	-	-	3300	4	NA	3300		131		892		385		236	
PCB-196	42740-50-1	pg/L	-	-	4940	4	NA	4940		175		1300		546		344	
PCB-197/200	33091-17-7/52663-73-7	pg/L	-	-	1130	4	NA	1130		44.8		364		101		76.4	
PCB-198/199	68194-17-2/52663-75-9	pg/L	-	-	7490	4	NA	7490		310		2270		957		623	
PCB-2	2051-61-8	pg/L	-	-	358	4	NA	358		232		251		135		12.5	J
PCB-20/28	38444-84-7/7012-37-5	pg/L	-	-	7630	4	NA	7630		1120		1670		1250		530	
PCB-201	40186-71-8	pg/L	-	-	871	3	NA	871				283		111		61.1	
PCB-202	2136-99-4	pg/L	-	-	1310	4	NA	1310		56		468	J	230	J	86.1	
PCB-203	52663-76-0	pg/L	-	-	5560	4	NA	5560		224		1630		723		434	
PCB-205	74472-53-0	pg/L	-	-	337	4	NA	337		20.2		81.5	J	39.3	J	33.7	
PCB-206	40186-72-9	pg/L	-	-	3120	4	NA	3120		147		1080	J	655	J	238	
PCB-207	52663-79-3	pg/L	-	-	347	3	NA	347				129		64.8		29	

Table 4-24a

Polychlorinated Biphenyls (PCBs) Detected in Pore Water (May 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			LD126		LD129		LD132		LD132DUP		LD136	
					Maximum	Number of	Number of	5/2/2013		5/2/2013		5/2/2013		5/2/2013		5/2/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-208	52663-77-1	pg/L	-	-	830	4	NA	830		40.6		390	J	256	J	66.7	
PCB-209	2051-24-3	pg/L	-	-	2320	4	NA	2320		103		792	J	682	J	137	
PCB-21/33	55702-46-0/38444-86-9	pg/L	-	-	2440	4	NA	2440		846		463		381		228	
PCB-22	38444-85-8	pg/L	-	-	2280	4	NA	2280		495		511		385		200	
PCB-24	55702-45-9	pg/L	-	-	1950	4	NA	1950		1580		1230		33		18	J
PCB-25	55712-37-3	pg/L	-	-	2170	4	NA	2170		139		783		568		51.3	
PCB-26/29	38444-81-4/15862-07-4	pg/L	-	-	3180	4	NA	3180		290		898		627		85.6	
PCB-27	38444-76-7	pg/L	-	-	6790	4	NA	3700		391		6790		3860		53.3	
PCB-3	2051-62-9	pg/L	-	-	1390	4	NA	983		479		1390	J	863	J	19.2	J
PCB-31	16606-02-3	pg/L	-	-	5990	4	NA	5990		1010		1730		1120		367	
PCB-32	38444-77-8	pg/L	-	-	4290	4	NA	4290		678		2930		1820		120	
PCB-34	37680-68-5	pg/L	-	-	72.7	2	NA	72.7				44		29.6			
PCB-35	37680-69-6	pg/L	-	-	76	2	NA	76								21.9	
PCB-37	38444-90-5	pg/L	-	-	1570	4	NA	1570		206		192	J	205	J	149	
PCB-4	13029-08-8	pg/L	-	-	127000	4	NA	16300		10300		127000	J	78900	J	186	
PCB-40/41/71	38444-93-8/52663-59-9/41464-46-4	pg/L	-	-	3980	4	NA	3980		170		2580		1160		247	
PCB-42	36559-22-5	pg/L	-	-	2190	3	NA	2190		156				723		148	
PCB-43	70362-46-8	pg/L	-	-	46.1	2	NA					46.1				21.5	
PCB-44/47/65	41464-39-5/2437-79-8/33284-54-7	pg/L	-	-	15700	4	NA	11000		441		15700		3360		407	
PCB-45/51	70362-45-7/68194-04-7	pg/L	-	-	4660	4	NA	4660		183		4280		2890		93.9	
PCB-46	41464-47-5	pg/L	-	-	693	3	NA	693		66.5				388		29.3	
PCB-48	70362-47-9	pg/L	-	-	155	3	NA			71.8		155		107		32.1	
PCB-49/69	41464-40-8/60233-24-1	pg/L	-	-	10500	4	NA	10500		240		8770		2550		228	
PCB-50/53	62796-65-0/41464-41-9	pg/L	-	-	5230	4	NA	4360		125		5230		3320		72	
PCB-52	35693-99-3	pg/L	-	-	31100	4	NA	13100		383		31100		1950		406	
PCB-54	15968-05-5	pg/L	-	-	2070	3	NA	536		13.8	J	2070		1500	J		
PCB-55	74338-24-2	pg/L	-	-	5610	1	NA	5610									
PCB-56	41464-43-1	pg/L	-	-	3380	3	NA			175		3380		360		199	
PCB-58	41464-49-7	pg/L	-	-	1130	1	NA					1130					
PCB-59/62/75	74472-33-6/54230-22-7/32598-12-2	pg/L	-	-	905	4	NA	905		40.6		227		117		38.8	J
PCB-6	25569-80-6	pg/L	-	-	5570	4	NA	2750		1190		5570		3030		64.4	
PCB-60	33025-41-1	pg/L	-	-	2510	4	NA	2510		90.9		1070		153		102	
PCB-61/70/74/76	33284-53-6/32598-11-1/32690-93-0/70362-48-0	pg/L	-	-	38500	4	NA	12000		546		38500		1110		723	
PCB-64	52663-58-8	pg/L	-	-	3560	4	NA	2260		160		3560		426		185	

Table 4-24a

Polychlorinated Biphenyls (PCBs) Detected in Pore Water (May 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			LD126		LD129		LD132		LD132DUP		LD136	
					Maximum	Number of	Number of	5/2/2013		5/2/2013		5/2/2013		5/2/2013		5/2/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-66	32598-10-0	pg/L	-	-	6280	3	NA			284		6280		809		378	
PCB-7	33284-50-3	pg/L	-	-	281	3	NA	249		86.8		281		175			
PCB-77	32598-13-3	pg/L	-	-	549	4	NA	549		34.8		158		66.2		52	
PCB-8	34883-43-7	pg/L	-	-	5960	4	NA	5960		4570		5760		3130		217	
PCB-80	33284-52-5	pg/L	-	-	262	1	NA					262					
PCB-81	70362-50-4	pg/L	-	-	369	1	NA					369					
PCB-82	52663-62-4	pg/L	-	-	8920	3	NA			48.8		8920		135		85.5	
PCB-83/99	60145-20-2/38380-01-7	pg/L	-	-	40500	4	NA	10300		245		40500	J	1630		410	
PCB-84	52663-60-2	pg/L	-	-	19300	4	NA	2430		132		19300		461		242	
PCB-85/116/117	65510-45-4/18259-05-7/68194-11-6	pg/L	-	-	29100	4	NA	29100		82.1		17300		288		191	
PCB-86/87/97/108/119/125	55312-69-1/38380-02-8/41464-51-1/70362-41-3/56558-17-9/74472-39-2	pg/L	-	-	61200	4	NA	10400		300		61200	J	1210		616	
PCB-88/91	55215-17-3/68194-05-8	pg/L	-	-	3080	4	NA	3080		67.4		2830		666		119	
PCB-9	34883-39-1	pg/L	-	-	393	3	NA	393		181		209		116			
PCB-90/101/113	68194-07-0/37680-73-2/68194-10-5	pg/L	-	-	83800	4	NA	22000		669		83800	J	3710		1400	
PCB-92	52663-61-3	pg/L	-	-	3840	3	NA	3840		123						204	
PCB-93/95/98/100/102	73575-56-1/38379-99-6/60233-25-2/39485-83-1/68194-06-9	pg/L	-	-	65900	4	NA	20900		642		65900	J	4580		1240	
PCB-96	73575-54-9	pg/L	-	-	389	2	NA	204				389		146			
Total DiCB	25512-42-9	pg/L	-	-	135000	4	NA	32100		17500		135000		77400		775	
Total HpCB	28655-71-2	pg/L	-	-	99000	4	NA	99000		4820		59900		17900		9700	
Total HxCB	26601-64-9	pg/L	-	-	366000	4	NA	147000		7210		366000		33200		14800	
Total MoCB	27323-18-8	pg/L	-	-	36100	4	NA	8830		6370		36100		19200		81.8	
Total NoCB	53742-07-7	pg/L	-	-	4300	4	NA	4300		188		1710		853		334	
Total OcCB	55722-26-4	pg/L	-	-	32500	4	NA	32500		1270		9150		3880		2460	
Total PCBs	1111-11-1	pg/L	74[2]	-	1320000	4	4	574000		58700		1320000		227000		41600	
Total PeCB	25429-29-2	pg/L	-	-	526000	4	NA	115000		3550		526000		18000		7110	
Total TeCB	26914-33-0	pg/L	-	-	125000	4	NA	74800		3180		125000		21100		3350	
Total TEQ	2222-22-2	pg/L	-	-	10.6	4	NA	5.1		0.023		10.6		0.73		0.91	
Total TrCB	25323-68-6	pg/L	-	-	58100	4	NA	58100		14500		56300		34600		2880	

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

1 - Duplicate samples were not included in the summary statistics.

2 - Total PCB value.

Table 4-24b

Polychlorinated Biphenyls (PCBs) Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			0301-00		0301-02		1001-00		1001-04		1601-00		1601-02	
					Maximum Detection	Number of Detections	Number of Exceedances	9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013	
Analyte	CAS #	Unit	BTAG	B				Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-1	2051-60-7	pg/L	-	-	1140	6	NA	48.7		177		70.3		1140		205		558	
PCB-10	33146-45-1	pg/L	-	-	57.1	5	NA			23.4		12.5	J	57.1		21.1		42	
PCB-103	60145-21-3	pg/L	-	-	12.4	3	NA			4.8	J			9.8	J			12.4	J
PCB-104	56558-16-8	pg/L	-	-	0	0	NA												
PCB-105	32598-14-4	pg/L	-	-	94.5	6	NA	12.3	J	15.7	J	21.2		94.5		26.6		61.3	
PCB-107/124	70424-68-9/70424-70-3	pg/L	-	-	0	0	NA												
PCB-109	74472-35-8	pg/L	-	-	0	0	NA												
PCB-11	2050-67-1	pg/L	-	-	100	6	NA	76		68.6		70.7		100		70.4		82	
PCB-110/115	38380-03-9/74472-38-1	pg/L	-	-	496	6	NA	80.8		112		125		496		141		326	
PCB-114	74472-37-0	pg/L	-	-	3.7	1	NA							3.7	J				
PCB-118	31508-00-6	pg/L	-	-	247	6	NA	32.3		42.9		56		247		61.9		164	
PCB-12/13	2974-92-7/2974-90-5	pg/L	-	-	140	3	NA			45.5				140				47.9	
PCB-123	65510-44-3	pg/L	-	-	1.1	1	NA									1.1	J		
PCB-126	57465-28-8	pg/L	-	-	0	0	NA												
PCB-128/166	38380-07-3/41411-63-6	pg/L	-	-	90.1	6	NA	9.1	J	12.4	J	16.6	J	90.1		22.3	J	36.9	J
PCB-129/138/160/163	55215-18-4/35065-28-2/41411-62-5/74472-44-9	pg/L	-	-	729	6	NA	83.3		109		164		729		193		291	
PCB-130	52663-66-8	pg/L	-	-	40.8	5	NA			6	J	6.9	J	40.8		8	J	18.2	J
PCB-131	61798-70-7	pg/L	-	-	0	0	NA												
PCB-132	38380-05-1	pg/L	-	-	113	5	NA	34.6		37.7		52.5				61.5		113	
PCB-133	35694-04-3	pg/L	-	-	0	0	NA												
PCB-134/143	52704-70-8/68194-15-0	pg/L	-	-	18.3	2	NA							18.3	J	8.7	J		
PCB-135/151/154	52744-13-5/52663-63-5/60145-22-4	pg/L	-	-	422	6	NA	45.2	J	87.4		106		422		126		201	
PCB-136	38411-22-2	pg/L	-	-	90.4	5	NA	17.2	J			29.7		90.4		35.3		61.1	
PCB-137	35694-06-5	pg/L	-	-	0	0	NA												
PCB-139/140	56030-56-9/59291-64-4	pg/L	-	-	0	0	NA												
PCB-141	52712-04-6	pg/L	-	-	128	6	NA	21.7		23.4		32.9		128		42.4		49.8	
PCB-144	68194-14-9	pg/L	-	-	8.3	1	NA			8.3	J								
PCB-145	74472-40-5	pg/L	-	-	0	0	NA												
PCB-146	51908-16-8	pg/L	-	-	99.6	6	NA	16.5	J	16.2	J	23.4		99.6		27.9		51.1	
PCB-147/149	68194-13-8/38380-04-0	pg/L	-	-	2520	5	NA	79.2				193		2520		210		767	
PCB-148	74472-41-6	pg/L	-	-	0	0	NA												
PCB-15	2050-68-2	pg/L	-	-	195	6	NA	51.1		67.7		55.3		195		60.3		140	
PCB-150	68194-08-1	pg/L	-	-	0	0	NA												
PCB-152	68194-09-2	pg/L	-	-	0	0	NA												
PCB-153/168	35065-27-1/59291-65-5	pg/L	-	-	668	6	NA	84.3		107		148		668		173		265	
PCB-155	33979-03-2	pg/L	-	-	0	0	NA												
PCB-156/157	38380-08-4/69782-90-7	pg/L	-	-	58.4	1	NA							58.4					
PCB-158	74472-42-7	pg/L	-	-	67.1	6	NA	6.7	J	9.6	J	13.5	J	67.1		16.2	J	26.8	

Table 4-24b

Polychlorinated Biphenyls (PCBs) Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

Analyte	CAS #	Unit	BTAG	B	Summary Statistics[1]			0301-00		0301-02		1001-00		1001-04		1601-00		1601-02	
					Maximum Detection	Number of Detections	Number of Exceedances	9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013	
								Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-159	39635-35-3	pg/L	-	-	6.9	2	NA							6.9	J	2.1	J		
PCB-16	38444-78-9	pg/L	-	-	595	6	NA	85		179		81.3		365		63.7		595	
PCB-161	74472-43-8	pg/L	-	-	0	0	NA												
PCB-162	39635-34-2	pg/L	-	-	0	0	NA												
PCB-164	74472-45-0	pg/L	-	-	57.6	5	NA	6.4	J	7.4	J	10.3	J	57.6		16.4	J		
PCB-167	52663-72-6	pg/L	-	-	21.3	5	NA	4.1	J	3.2	J			21.3		5.2	J	8.3	J
PCB-169	32774-16-6	pg/L	-	-	0	0	NA												
PCB-17	37680-66-3	pg/L	-	-	597	6	NA	71.8		221		109		597		76.3		583	
PCB-170	35065-30-6	pg/L	-	-	212	6	NA	16.2	J	29.3		34.3		212		45.6		63.6	
PCB-171/173	52663-71-5/68194-16-1	pg/L	-	-	69.2	4	NA					14.6	J	69.2		18.1	J	18.5	J
PCB-172	52663-74-8	pg/L	-	-	37.7	3	NA							37.7		9.5	J	11.1	J
PCB-174	38411-25-5	pg/L	-	-	239	5	NA	17.1	J	26.9		36.5		239		56.6			
PCB-175	40186-70-7	pg/L	-	-	0	0	NA												
PCB-176	52663-65-7	pg/L	-	-	28.8	3	NA			4.7	J			28.8				8.8	J
PCB-177	52663-70-4	pg/L	-	-	138	5	NA	13.3	J	17.4	J	21.9		138		29.1			
PCB-178	52663-67-9	pg/L	-	-	55.1	3	NA							55.1		7.7	J	16.5	J
PCB-179	52663-64-6	pg/L	-	-	104	3	NA							104		24.9		31.5	
PCB-18/30	37680-65-2/35693-92-6	pg/L	-	-	1220	6	NA	153		437		203		967		159		1220	
PCB-180/193	35065-29-3/69782-91-8	pg/L	-	-	487	6	NA	41.5		74.6		88.8		487		125		168	
PCB-183/185	52663-69-1/52712-05-7	pg/L	-	-	154	5	NA	15.4	J	23.9	J	30.2	J	154		37.4	J		
PCB-187	52663-68-0	pg/L	-	-	182	6	NA	25.9		43.5		50.6		182		68.2		94.2	
PCB-189	39635-31-9	pg/L	-	-	2.3	1	NA									2.3	J		
PCB-19	38444-73-4	pg/L	-	-	430	6	NA	93.2		214		76.8		430		110		399	
PCB-190	41411-64-7	pg/L	-	-	34.1	6	NA	3.8	J	6.4	J	8	J	34.1		10.5	J	11.9	J
PCB-191	74472-50-7	pg/L	-	-	9.1	1	NA							9.1	J				
PCB-194	35694-08-7	pg/L	-	-	106	6	NA	9.9	J	12.5	J	12.9	J	106		27.3		41.9	
PCB-195	52663-78-2	pg/L	-	-	49.1	5	NA	3.8	J			7.1	J	49.1		11.3	J	14.8	J
PCB-196	42740-50-1	pg/L	-	-	78.6	5	NA			10.1	J	8.9	J	78.6		18.1	J	38.3	
PCB-197/200	33091-17-7/52663-73-7	pg/L	-	-	0	0	NA												
PCB-198/199	68194-17-2/52663-75-9	pg/L	-	-	107	5	NA			21.5	J	13.5	J	107		31.1	J	45.8	
PCB-2	2051-61-8	pg/L	-	-	63	5	NA			7.3	J	4.7	J	63		4.7	J	23.6	
PCB-20/28	38444-84-7/7012-37-5	pg/L	-	-	1420	6	NA	136		282		213		1420		181		793	
PCB-201	40186-71-8	pg/L	-	-	12.4	1	NA							12.4	J				
PCB-202	2136-99-4	pg/L	-	-	0	0	NA												
PCB-203	52663-76-0	pg/L	-	-	68.3	6	NA	6.2	J	14.8	J	12.6	J	68.3		19	J	31.7	
PCB-205	74472-53-0	pg/L	-	-	6.6	1	NA							6.6	J				
PCB-206	40186-72-9	pg/L	-	-	49.8	3	NA							49.8		12.3	J	28.5	
PCB-207	52663-79-3	pg/L	-	-	4.3	2	NA							4.3	J			2.8	J
PCB-208	52663-77-1	pg/L	-	-	6.4	1	NA											6.4	J
PCB-209	2051-24-3	pg/L	-	-	21.3	3	NA	2.3	J					21.3				12.4	J

Table 4-24b
Polychlorinated Biphenyls (PCBs) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			0301-00		0301-02		1001-00		1001-04		1601-00		1601-02	
					Maximum Detection	Number of Detections	Number of Exceedances	9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013	
Analyte	CAS #	Unit	BTAG	B				Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-21/33	55702-46-0/38444-86-9	pg/L	-	-	304	6	NA	47.9		75.3		93.7		157		55.4		304	
PCB-22	38444-85-8	pg/L	-	-	296	6	NA	52.3		82.7		95.1		296		57.6		265	
PCB-24	55702-45-9	pg/L	-	-	46.5	1	NA	46.5											
PCB-25	55712-37-3	pg/L	-	-	521	6	NA	26.1		110		43.5		521		28		280	
PCB-26/29	38444-81-4/15862-07-4	pg/L	-	-	553	6	NA	32	J	124		58.2		553		35.7	J	319	
PCB-27	38444-76-7	pg/L	-	-	283	6	NA	24.3		85.7		33.8		88.3		46.9		283	
PCB-3	2051-62-9	pg/L	-	-	98.1	5	NA			20.1		10.9	J	97.8		18.3	J	98.1	
PCB-31	16606-02-3	pg/L	-	-	999	6	NA	115		243		243		999		130		700	
PCB-32	38444-77-8	pg/L	-	-	734	6	NA	76		216		117		734		98.3		479	
PCB-34	37680-68-5	pg/L	-	-	0	0	NA												
PCB-35	37680-69-6	pg/L	-	-	0	0	NA												
PCB-37	38444-90-5	pg/L	-	-	97.8	6	NA	25.8		28.7		41.1		97.8		30.7		87.9	
PCB-4	13029-08-8	pg/L	-	-	1810	6	NA	188		581		198		1810		440		848	
PCB-40/41/71	38444-93-8/52663-59-9/41464-46-4	pg/L	-	-	500	6	NA	64.7		133		77.6		427		76		500	
PCB-42	36559-22-5	pg/L	-	-	230	6	NA	24.1		75.9		53.1		172		51.4		230	
PCB-43	70362-46-8	pg/L	-	-	0	0	NA												
PCB-44/47/65	41464-39-5/2437-79-8/33284-54-7	pg/L	-	-	832	6	NA	98.7		301		141		815		160		832	
PCB-45/51	70362-45-7/68194-04-7	pg/L	-	-	499	6	NA	62.6		210		62.9		499		77.7		462	
PCB-46	41464-47-5	pg/L	-	-	137	5	NA	13	J	53.1				137		26.1		136	
PCB-48	70362-47-9	pg/L	-	-	75.1	6	NA	11.6	J	22.6		21.1		51.1		17.2	J	75.1	
PCB-49/69	41464-40-8/60233-24-1	pg/L	-	-	748	6	NA	79.5		223		104		748		103		606	
PCB-50/53	62796-65-0/41464-41-9	pg/L	-	-	496	6	NA	55		198		54		496		70.9		487	
PCB-52	35693-99-3	pg/L	-	-	855	6	NA	124		295		165		795		221		855	
PCB-54	15968-05-5	pg/L	-	-	74.2	3	NA			31				51.2				74.2	
PCB-55	74338-24-2	pg/L	-	-	0	0	NA												
PCB-56	41464-43-1	pg/L	-	-	112	5	NA	24.2		30		37.7		112		35.3			
PCB-57	70424-67-8	pg/L	-	-	0	0	NA												
PCB-58	41464-49-7	pg/L	-	-	0	0	NA												
PCB-59/62/75	74472-33-6/54230-22-7/32598-12-2	pg/L	-	-	72.3	6	NA	12	J	16.9	J	12.3	J	72.3		14.8	J	31.4	J
PCB-6	25569-80-6	pg/L	-	-	1020	6	NA	37.8		196		60.7		1020		48.1		365	
PCB-60	33025-41-1	pg/L	-	-	42.3	5	NA	6.8	J	8.6	J	16.3	J	42.3		14.8	J		
PCB-61/70/74/76	33284-53-6/32598-11-1/32690-93-0/70362-48-0	pg/L	-	-	443	6	NA	78.4	J	104		128		361		108		443	
PCB-64	52663-58-8	pg/L	-	-	194	6	NA	37.7		61.3		64		165		61.8		194	
PCB-66	32598-10-0	pg/L	-	-	228	6	NA	36.8		58		59.9		228		55.7		223	
PCB-68	73575-52-7	pg/L	-	-	0	0	NA												
PCB-7	33284-50-3	pg/L	-	-	56.2	2	NA							56.2				35.6	

Table 4-24b
Polychlorinated Biphenyls (PCBs) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			0301-00		0301-02		1001-00		1001-04		1601-00		1601-02	
					Maximum	Number of	Number of	9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013	
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-72	41464-42-0	pg/L	-	-	0	0	NA												
PCB-77	32598-13-3	pg/L	-	-	23	2	NA							23				15.6	J
PCB-8	34883-43-7	pg/L	-	-	1060	6	NA	84.8		263		161		1060		105		582	
PCB-80	33284-52-5	pg/L	-	-	0	0	NA												
PCB-81	70362-50-4	pg/L	-	-	0	0	NA												
PCB-82	52663-62-4	pg/L	-	-	42.7	3	NA			9.5	J			42.7				30.1	
PCB-83/99	60145-20-2/38380-01-7	pg/L	-	-	247	6	NA	24.9	J	50.3		49		201		55.7		247	
PCB-84	52663-60-2	pg/L	-	-	126	6	NA	18.7	J	36.5		27.6		91.6		39		126	
PCB-85/116/117	65510-45-4/18259-05-7/68194-11-6	pg/L	-	-	69.8	6	NA	8.2	J	15.1	J	16	J	35.5	J	18.2	J	69.8	
PCB-86/87/97/108/119/125	55312-69-1/38380-02-8/41464-51-1/70362-41-3/56558-17-9/74472-39-2	pg/L	-	-	215	6	NA	32	J	54.3	J	61.8	J	214		67.5	J	215	
PCB-88/91	55215-17-3/68194-05-8	pg/L	-	-	80.3	6	NA	8.8	J	17.9	J	14.5	J	68.1		17.5	J	80.3	
PCB-89	73575-57-2	pg/L	-	-	1.5	1	NA			1.5	J								
PCB-9	34883-39-1	pg/L	-	-	79.9	3	NA					14.8	J	79.9				49.2	
PCB-90/101/113	68194-07-0/37680-73-2/68194-10-5	pg/L	-	-	367	6	NA	75.5		97.6		131		367		134		355	
PCB-92	52663-61-3	pg/L	-	-	83.3	5	NA	14.1	J	24.3				76.2		23.8		83.3	
PCB-93/95/98/100/102	73575-56-1/38379-99-6/60233-25-2/39485-83-1/68194-06-9	pg/L	-	-	415	5	NA	103		132				371		159		415	
PCB-94	73575-55-0	pg/L	-	-	11.8	3	NA			5.7	J			8.7	J			11.8	J
PCB-96	73575-54-9	pg/L	-	-	12.4	3	NA			3.5	J			8.4	J			12.4	J
Total DiCB	25512-42-9	pg/L	-	-	4510	6	NA	437		1250		572		4510		745		2190	
Total HpCB	28655-71-2	pg/L	-	-	1750	6	NA	133		227		285		1750		434		424	
Total HxCB	26601-64-9	pg/L	-	-	5020	6	NA	408		435		808		5020		962		1910	
Total MoCB	27323-18-8	pg/L	-	-	1310	6	NA	48.7		204		85.9		1310		228		679	
Total NoCB	53742-07-7	pg/L	-	-	54.1	3	NA							54.1		12.3		37.7	
Total OcCB	55722-26-4	pg/L	-	-	428	6	NA	19.9		58.9		55		428		107		173	
Total PCBs	1111-11-1	pg/L	74[2]	-	27800	6	11	3170		6920		4710		27800		5390		19100	
Total PeCB	25429-29-2	pg/L	-	-	2330	6	NA	411		623		502		2330		746		2210	
Total TeCB	26914-33-0	pg/L	-	-	5200	6	NA	729		1820		997		5200		1090		5160	
Total TEQ	2222-22-2	pg/L	-	-	0.015	6	NA	0.0015		0.0019		0.0024		0.015		0.003		0.0085	
Total TrCB	25323-68-6	pg/L	-	-	7220	6	NA	985		2300		1410		7220		1070		6310	

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)
B = Bioaccumulative
Highlighted values indicate their exceedances of BTAG benchmark.
1 - Duplicate samples were not included in the summary statistics.
2 - Total PCB value.

Table 4-25

Dioxin/Furan Detected in Pore Water (September 2013)

Lower Darby Creek Area (LDCA) Site

Operable Unit 3 (OU-3) - Clearview Landfill Groundwater

					Summary Statistics[1]			0301-00	0301-02	1001-00	1001-04	1601-00	1601-02
					Maximum	Number of	Number of	9/9/2013	9/9/2013	9/11/2013	9/11/2013	9/11/2013	9/11/2013
Analyte	CAS #	Unit	BTAG	B	Detection	Detections	Exceedances	Result	Result	Result	Result	Result	Result
OCDD	3268-87-9	pg/L	-	-	479	2	NA				239		479
Total TEQ Bird	2222-20-0	pg/L	-	-	0.0479	2	NA				0.0239		0.0479
Total TEQ Fish[2]	2222-21-0	pg/L	0.003	-	0.0479	2	2				0.0239		0.0479
Total TEQ Mammal	3333-30-0	pg/L	-	-	0.144	2	NA				0.0717		0.144

BTAG = EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006)

B = Bioaccumulative

Highlighted values indicate their exceedances of BTAG benchmark.

1 - Duplicate samples were not included in the summary statistics.

2 - The BTAG value for 2,3,7,8-TCDD is used as the screening benchmark for fish.

Table 4-26
Comparison Between Pore Water and Shallow Groundwater Samples
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

	Groundwater								Pore Water							
LOCATION	**RSL**	**MW-03**	**MW-03**	**MW-03**	**MW-04**	**MW-04**	**MW-04**	**MW-04**	**PW-0301**	**PW-0301**	**PW-0301**	**PW-0301**	**PW-0301**	**PW-0301**	**PW-0301**	**BTAG**
SAMPLE ID	**Screening Level**	**LDCA-MW03-0314**	**LDCA-MW03-1014**	**LDCA-MW03-0615**	**LDCA-MW04-0314**	**LDCA-MW04-1014**	**LDCA-MW04-0615**	**LDCA-MW04-0615-D**	**LDCA-PW-0301-00-20130909**	**LDCA-PW-0301-02-20130909**	**LDCA-PW-0301-02-20130909-D**	**LDCA-PW-0301-00-0216**	**LDCA-PW-0301-02-0216**	**LDCA-PW-0301-02-0216-D**	**LDCA-PW-0301-04-0216**	**Benchmark**
SAMPLE DATE	**for Tap Water**	**3/11/2014**	**12/4/2014**	**7/9/2015**	**3/20/2014**	**12/18/2014**	**7/17/2015**	**7/17/2015**	**9/9/2013**	**9/9/2013**	**9/9/2013**	**2/25/2016**	**2/25/2016**	**2/25/2016**	**2/25/2016**	
POLYCYCLIC AROMATIC HYDROCARBONS (UG/L)																
2-METHYLNAPHTHALENE	3.6	0.10 U	0.015 J	0.10 U	0.097 J	0.032 J	0.10 U	0.10 U	0.017 J	0.01 J	0.012 J	--	--	--	--	4.7
ACENAPHTHENE	530	--	0.03 J	0.10 UJ	--	1.6	1.2	0.98	0.033 J	0.094 J	0.1	--	--	--	--	5.8
ACENAPHTHYLENE		0.10 U	0.035 J	0.10 UJ	0.10 U	0.15	0.10 U	0.10 U	0.012 J	0.021 J	0.024 J	--	--	--	--	
ANTHRACENE	1800	0.10 U	0.11	0.14	--	0.10 U	0.24	0.37	**0.077 J**	**0.098**	**0.11**	--	--	--	--	0.012
BENZO(A)ANTHRACENE	0.03	--	0.10 U	0.10 UJ	--	0.015 J	0.10 U	0.10 U	0.10 U	**0.038 J**	0.10 U	--	--	--	--	0.018
CHRYSENE	25	--	0.10 U	0.10 UJ	--	0.0061 J	0.10 U	0.10 U	0.10 U	0.043 J	0.10 U	--	--	--	--	
FLUORANTHENE	800	--	0.10 U	0.10 U	--	0.061 J	0.09 J	0.095 J	0.037 J	**0.052 J**	0.04 J	--	--	--	--	0.04
FLUORENE	290	--	0.10 U	0.10 U	--	0.98	0.95	0.75	0.035 J	0.10 U	0.10 U	--	--	--	--	3
NAPHTHALENE	0.17	--	0.10 U	0.10 U	--	0.10 U	**0.34**	0.17	0.046 J	0.015 J	0.016 J	--	--	--	--	1.1
PENTACHLOROPHENOL	0.041	0.20 U	--	0.20 U	--	--	0.20 U	0.20 U	0.11 J	0.20 R	0.20 R	--	--	--	--	0.5
PHENANTHRENE		--	0.10 U	0.10 UJ	0.51	0.92	0.49	0.52	0.045 J	0.073 J	0.098	--	--	--	--	0.4
PYRENE	120	--	0.10 U	0.10 U	0.10 U	0.10 UJ	0.087 J	0.12	**0.032 J**	**0.098**	**0.092 J**	--	--	--	--	0.025
DIOXINS/FURANS (PG/L)																
1,2,3,4,6,7,8,9-OCDD	400	0.313 U	0.695 U	--	**2100**	161	--	--	100 U	100 U	--	--	--	--	--	
1,2,3,4,6,7,8,9-OCDF		0.167 U	0.77 U	--	0.117 U	8.15 J	--	--	100 U	100 U	--	--	--	--	--	
1,2,3,4,6,7,8-HPCDD	12	0.132 U	0.881 U	--	**220**	1.09 U	--	--	50 U	50 U	--	--	--	--	--	
1,2,3,4,7,8-HXCDD		0.22 U	0.792 J	--	0.203 U	0.351 U	--	--	50 U	50 U	--	--	--	--	--	
1,2,3,4,7,8-HXCDF	1	0.114 U	**1.16 Z**	--	0.212 U	**1.41 J**	--	--	50 U	50 U	--	--	--	--	--	
1,2,3,6,7,8-HXCDD		0.229 U	0.915 Z	--	0.214 U	0.33 U	--	--	50 U	50 U	--	--	--	--	--	
1,2,3,6,7,8-HXCDF	1	0.0973 U	**1.03 Z**	--	0.204 U	0.569 Z	--	--	50 U	50 U	--	--	--	--	--	
1,2,3,7,8,9-HXCDD	1	0.236 U	0.422 U	--	0.222 U	0.491 J	--	--	50 U	50 U	--	--	--	--	--	
1,2,3,7,8,9-HXCDF	1	0.142 U	**1.4 J**	--	0.262 U	0.366 U	--	--	50 U	50 U	--	--	--	--	--	
2,3,4,6,7,8-HXCDF	1	0.109 U	**1.01 Z**	--	0.208 U	0.299 U	--	--	50 U	50 U	--	--	--	--	--	
TEQ	0.1	0.187 U	**0.63**	--	**2.83**	**0.30**	--	--	10 U	10 U	--	--	--	--	--	
TEQ BIRD		0.187 U	0.50875	--	0.43	0.26	--	--	10 U	10 U	--	--	--	--	--	
TEQ BIRD HALFND		0.187 U	1.59	--	0.93	1.50	--	--	10 U	10 U	--	--	--	--	--	
TEQ FISH		0.187 U	0.87	--	0.43	0.22	--	--	10 U	10 U	--	--	--	--	--	0.003
TEQ FISH HALFND		0.187 U	1.65	--	0.75	0.92	--	--	10 U	10 U	--	--	--	--	--	0.003
TEQ HALFND	0.1	0.187 U	**1.40**	--	**3.10**	**0.95**	--	--	10 U	10 U	--	--	--	--	--	
TEQ MAMMAL		--	0.552	--	--	0.108	--	--	0.00 U	0.00 U	--	--	--	--	--	
TOTAL HPCDD		0.00 U	0.881 U	--	510	1.09 U	--	--	0.60 U	0.45 U	--	--	--	--	--	
TOTAL HXCDD		0.00 U	1.71 Z	--	51 U	6.36 Z	--	--	0.50 U	0.45 U	--	--	--	--	--	
TOTAL HXCDF		0.00 U	4.6 Z	--	51 U	3.18 Z	--	--	0.32 U	0.26 U	--	--	--	--	--	
TOTAL PECDD		0.00 U	0.775 U	--	51 U	0.923 Z	--	--	0.59 U	0.61 U	--	--	--	--	--	
TOTAL PECDF		0.00 U	0.345 U	--	51 U	0.518 Z	--	--	0.48 U	0.38 U	--	--	--	--	--	
TOTAL TCDF		0.00 U	0.372 U	--	110	0.592 Z	--	--	0.56 U	0.48 U	--	--	--	--	--	
METALS (UG/L)																
ALUMINUM	20000	20 UJ	20 U	--	25.9	20 U	45	60.1	40	**101**	20 U	**384**	**120**	52.3	**11000**	87
ANTIMONY	7.8	2 U	0.33 J	--	2 U	2 U	0.67 J	0.81 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U	30
ARSENIC	0.052	**5.1**	**10**	--	1 U	**1.1**	**0.63**	**0.66**	**14.7 J+**	**8.1 J+**	**8.4 J+**	1 U	1 U	1 U	4.7	5
BARIUM	3800	453	1060	--	1530	2220	1840	1850	**469**	**466**	**453**	**186**	**183**	**187**	**380**	4
BORON	4000	2490	3160 J+	--	1430	1360	--	--	**475**	**952**	**948**	--	--	--	--	1.6
CADMIUM	9.2	0.099 J	1 UJ	--	1 U	1 U	0.033 J	0.044 J	1 U	1 U	1 U	0.20 U	0.20 U	0.20 U	**1.4**	0.25
CALCIUM		89200 J	156000	--	137000 J	172000	168000	167000	106000	**127000**	**122000**	60000	66300	66500	**157000**	116000
CHROMIUM	44	6.5 J	10.3	--	5.1 J	5.7	3.9	4.1	0.84 J	2.7	1.9 J	2 U	2 U	2 U	37	85

	Groundwater								Pore Water							
LOCATION	RSL	MW-03	MW-03	MW-03	MW-04	MW-04	MW-04	MW-04	PW-0301	PW-0301	PW-0301	PW-0301	PW-0301	PW-0301	PW-0301	BTAG
SAMPLE ID	Screening Level	LDCA-MW03-0314	LDCA-MW03-1014	LDCA-MW03-0615	LDCA-MW04-0314	LDCA-MW04-1014	LDCA-MW04-0615	LDCA-MW04-0615-D	LDCA-PW-0301-00-20130909	LDCA-PW-0301-02-20130909	LDCA-PW-0301-02-20130909-D	LDCA-PW-0301-00-0216	LDCA-PW-0301-02-0216	LDCA-PW-0301-02-0216-D	LDCA-PW-0301-04-0216	Benchmark
SAMPLE DATE	for Tap Water	3/11/2014	12/4/2014	7/9/2015	3/20/2014	12/18/2014	7/17/2015	7/17/2015	9/9/2013	9/9/2013	9/9/2013	2/25/2016	2/25/2016	2/25/2016	2/25/2016	
COBALT	6	**6.5**	50 U	--	0.78 J	1.4	0.95 J	0.97 J	3.1	2.3	2.1	1 U	1 U	1 U	9.2	23
COPPER	800	5.2	25 U	--	6.4	0.89 J	1.6 J	2.2	2 UJ	2.7	2 UJ	8.9	4.3	2.8	**68.9 J**	9
IRON	14000	**44900 J**	**55100**	--	**21200**	**31100**	**29000 J**	**28800 J**	**81500**	**76000**	**72300**	**40900**	**40300**	**40700**	**70300**	300
LEAD	15	2.8	1 U	--	2.9 J	1 U	4.4	5.1	**4**	**9.3**	1 U	**11.4**	1.3	1 U	**425**	2.5
MAGNESIUM		127000	191000	--	54500	80000	71900	71600	45800	64100	60400	25900	28600	28300	**89300**	82000
MANGANESE	430	**535 J**	**969**	--	293	**494**	380	382	**3200**	**2360**	**2360**	**3080**	**3300**	**3340**	**2080**	120
MERCURY	0.63	0.20 U	0.044 J	--	0.20 U	0.11 J-	0.034 J	0.025 J	**0.13 J**	**0.12 J**	**0.099 J**	--	--	--	--	0.026
NICKEL	390	6.4 J	5.6	--	6.6 J	6.9	4.8	4.9	2.5 J	2.4 J	1.6 J	2.2	2	1.8	22.4	52
POTASSIUM		39900	79200	--	22800	30200	27900	28000	11400	16500	16100	5030	4970	4990	15600	53000
SELENIUM	100	1.7 J	0.55 J	--	5 U	5 U	0.22 J	0.20 J	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1
SILVER	94	1 U	1 U	--	1 U	1 U	0.019 J	0.031 J	1 UJ	1 UJ	1 UJ	1 U	1 U	1 U	1 U	3.2
SODIUM		143000	262000	--	79400	113000	102000	101000	60800 J	131000 J	126000 J	85600	48400	48200	98200	680000
THALLIUM	0.2	1 U	1 U	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.20 U	0.20 U	0.20 U	0.2	0.8
VANADIUM	86	2.2 J	5.8	--	5 U	2.1 J	1.9 J	2 J	2.6 U	2.6 UJ	2.6 U	5 U	5 U	5 U	**31.5 J**	20
ZINC	6000	19.3 J	2 U	--	9.4	4.6	7.7	14.8	7.6	11	12	13	5.2 J	2.5	**327**	120
FILTERED METALS (UG/L)																
ALUMINUM	20000	20 UJ	20 U	11	30.3	20 U	9.3 J	9.4 J	--	--	--	20 U	20 U	20 U	20 U	87
ANTIMONY	7.8	2 U	2 U	0.21	2 U	2 U	2 U	2 U	--	--	--	2 U	2 U	2 U	2 U	30
ARSENIC	0.052	**5.1**	**6.2**	**4.9**	1 U	1.1	**0.59**	**0.61**	--	--	--	1 U	1 U	1 U	1.2	5
BARIUM	3800	456	650	602	1870	1800	1820	1810	--	--	--	**169**	**177**	**164**	**177**	4
CALCIUM		88900	102000	111000	150000 J	182000	168000	169000	--	--	--	59100	66000	89000	**147000**	116000
CHROMIUM	44	5.1 J	5.1	4.6	30.2	3.9	3.6	3.6	--	--	--	2 U	2 U	2 U	2 U	85
COBALT	6	3.1	2.5 J	2.3	1.2 J	1.2 J	0.92 J	0.93 J	--	--	--	1 U	1 U	1 U	1	23
COPPER	800	7.4	2 U	0.39	5.9	0.36 J-	2 U	2 U	--	--	--	6.2	3.5	3	6.1	9
IRON	14000	**42900**	**44400 J**	**50600**	**24600**	**24100 J**	**29800**	**29900**	--	--	--	**40100**	**40700**	**50200**	**51700**	300
LEAD	15	1.5	1 U	0.043	1.8	1 U	0.036 J	0.032 J	--	--	--	1 U	1 U	1 U	1 U	2.5
MAGNESIUM		117000	125000	136000	60800	63900	71700	71700	--	--	--	25700	28300	44500	**82700**	82000
MANGANESE	430	**536 J**	**565**	**521**	335	397	389	397	--	--	--	**3100**	**3340**	**4020**	**1580**	120
NICKEL	390	6.5	3.9 J	2.8	24.4	5.5 J	4.4	4.4	--	--	--	1.3	1.5	2.5	4.1	52
POTASSIUM		39300	50100 J	53600	26100	26500	28000	28000	--	--	--	5060	5070	7830	13700	53000
SELENIUM	100	5 U	0.48 J	5 U	5 U	5 U	5 U	5 U	--	--	--	1 U	1 U	1 U	1 U	1
SODIUM		134000	170000	181000	89200	91800	102000	102000	--	--	--	89900	49300	42100	103000	680000
VANADIUM	86	5 U	4.4	2.7	5 U	1.8 J	1.7 J	1.7 J	--	--	--	5 U	5 U	5 U	5 U	20
ZINC	6000	8.9 J	2 UJ	1.7	10.4 J	2 U	2.3 J	2.9 J	--	--	--	2 U	2.1	2 U	3	120
PESTICIDES (UG/L)																
4,4'-DDD	0.032	0.10 U	0.0005 J	0.001 U	0.10 U	0.00045 J	0.00095 U	--	0.01 U	0.01 U	0.01 U	--	--	--	--	0.011
4,4'-DDE	0.046	0.10 U	0.0005 J	0.001 U	0.10 U	0.00025 J	0.00095 U	--	0.01 U	0.01 U	0.01 U	--	--	--	--	
4,4'-DDT	0.23	0.10 U	0.0097 UJ	0.001 U	0.03 J	0.002 J	0.0019 U	--	0.01 U	0.01 U	0.01 U	--	--	--	--	0.0005
ALDRIN	0.00092	0.05 U	**0.001 J**	0.00299 U	0.05 U	**0.0024 J**	0.00379 U	--	0.005 U	0.005 U	0.005 U	--	--	--	--	3
ALPHA-BHC	0.0072	0.05 U	0.0023 J	0.001 U	0.05 U	0.00031 J	0.00095 U	--	0.001 U	0.001 U	0.001 U	--	--	--	--	
ALPHA-CHLORDANE	0.02	0.05 U	0.0041 J	0.001 U	0.017 J	0.02 J	0.00095 U	--	0.005 U	0.005 U	0.005 U	--	--	--	--	0.0022
BETA-BHC	0.025	**0.078 J**	0.0007 J	0.001 U	0.05 U	0.0024 J	0.00095 U	--	0.001 U	0.001 U	0.001 U	--	--	--	--	
DELTA-BHC	0.0071	0.05 U	0.0036 J	0.001 U	0.05 U	0.0025 J	0.00095 U	--	0.001 J	0.005 U	0.005 U	--	--	--	--	141
DIELDRIN	0.0018	0.10 U	0.0019 UJ	0.00199 U	0.10 U	0.00039 J	0.0019 U	--	0.0099	0.0057 J	0.0052 J	--	--	--	--	0.056
ENDOSULFAN I	100	0.05 U	0.0006 J	0.001 U	0.05 U	0.00023 J	0.0019 U	--	0.001 J	0.001 J	0.005 U	--	--	--	--	0.051
ENDOSULFAN II	100	0.10 U	0.0097 UJ	0.00199 U	0.025 J	0.0027 J	0.0019 U	--	0.0045 J	0.01 U	0.01 U	--	--	--	--	0.051

Table 4-26
Comparison Between Pore Water and Shallow Groundwater Samples
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

	Groundwater								Pore Water							
LOCATION	**RSL**	**MW-03**	**MW-03**	**MW-03**	**MW-04**	**MW-04**	**MW-04**	**MW-04**	**PW-0301**	**PW-0301**	**PW-0301**	**PW-0301**	**PW-0301**	**PW-0301**	**PW-0301**	**BTAG**
SAMPLE ID	**Screening Level**	**LDCA-MW03-0314**	**LDCA-MW03-1014**	**LDCA-MW03-0615**	**LDCA-MW04-0314**	**LDCA-MW04-1014**	**LDCA-MW04-0615**	**LDCA-MW04-0615-D**	**LDCA-PW-0301-00-20130909**	**LDCA-PW-0301-02-20130909**	**LDCA-PW-0301-02-20130909-D**	**LDCA-PW-0301-00-0216**	**LDCA-PW-0301-02-0216**	**LDCA-PW-0301-02-0216-D**	**LDCA-PW-0301-04-0216**	**Benchmark**
SAMPLE DATE	**for Tap Water**	**3/11/2014**	**12/4/2014**	**7/9/2015**	**3/20/2014**	**12/18/2014**	**7/17/2015**	**7/17/2015**	**9/9/2013**	**9/9/2013**	**9/9/2013**	**2/25/2016**	**2/25/2016**	**2/25/2016**	**2/25/2016**	
ENDRIN	2.3	0.10 U	0.0097 UJ	0.001 U	0.058 J	0.00026 J	0.00095 U	--	0.01 U	0.01 U	0.01 U	--	--	--	--	0.036
ENDRIN ALDEHYDE	2.3	0.10 U	0.0097 UJ	0.001 U	0.039 J	0.001 J	0.0019 U	--	0.0013 J	0.01 U	0.01 U	--	--	--	--	0.036
ENDRIN KETONE	2.3	0.10 U	0.0097 UJ	0.00199 U	0.10 U	0.00076 J	0.0019 U	--	0.01 U	0.01 U	0.01 U	--	--	--	--	0.036
GAMMA-BHC (LINDANE)	0.042	0.05 U	0.0005 J	0.001 U	0.05 U	0.0044 J	0.00095 U	--	0.005 U	0.005 U	0.005 U	--	--	--	--	0.01
GAMMA-CHLORDANE	0.02	0.05 U	0.0049 UJ	0.001 U	**0.035 J**	0.00037 J	0.00095 U	--	0.005 U	0.005 U	0.005 U	--	--	--	--	0.0022
HEPTACHLOR	0.0014	0.05 U	0.0008 J	0.001 U	0.05 U	**0.0075 J**	0.00095 U	--	0.001 J	0.001 U	0.001 U	--	--	--	--	0.0019
HEPTACHLOR EPOXIDE	0.0014	0.05 U	0.0019 UJ	0.001 U	0.05 U	0.00069 J	0.00095 U	--	0.002 U	0.002 U	0.002 U	--	--	--	--	0.0019
SEMIVOLATILES (UG/L)																
1,4-DIOXANE	0.46	**13**	--	**23**	**14**	--	**24**	**24**	0.59 J	8.9	9.6	--	--	--	--	
ACENAPHTHENE	530	5 U	1.5 U	--	1.6	1.6 J	2.3 J	5 U	5 U	5 U	5 U	--	--	--	--	5.8
BIS(2-ETHYLHEXYL)PHTHALATE	5.6	5 U	5 U	5 U	2.8 J	5 U	1.4 J	1.5 J	5 U	5 U	5 U	--	--	--	--	16
BUTYL BENZYL PHTHALATE	16	5 U	5 U	5 U	5 U	5 U	0.71 J	0.49 J	5 U	5 U	5 U	--	--	--	--	19
FLUORENE	290	5 U	5 U	--	1.3	1.2 J	1.5 J	1.5 J	5 U	5 U	5 U	--	--	--	--	3
N-NITROSODIPHENYLAMINE	12	5 U	5 U	5 U	5 U	0.45 J	5 U	1.1 J	5 U	5 U	5 U	--	--	--	--	210
PHENANTHRENE		5 U	5 U	--	--	5 U	0.70 J	0.69 J	5 U	5 U	5 U	--	--	--	--	0.4
PCBS (PG/L)																
TEQ	0.1	0	0.00015	--	**0.15**	0.017	--	--	0.0015	0.0019	--	--	--	--	--	
TOTAL PCB CONGENERS	44000	9900	--	--	**600000**	**400000 Z**	--	--	**3170**	**6920**	--	--	--	--	--	0.000074

Table 4-26
Comparison Between Pore Water and Shallow Groundwater Samples
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

	Groundwater									Pore Water		
LOCATION	**RSL**	**MW-07D**	**MW-07D**	**MW-07D**	**MW-07D**	**MW-07S**	**MW-07S**	**MW-07S**	**MW-07S**	**PW-1802**	**PW-1802**	**BTAG**
SAMPLE ID	**Screening Level**	**LDCA-MW07D-0314**	**LDCA-MW07D-1014**	**LDCA-MW07D-0615**	**LDCA-MW07D-0416**	**LDCA-MW07S-0314**	**LDCA-MW07S-1014**	**LDCA-MW07S-0615**	**LDCA-MW07S-0416**	**LDCA-PW-1802-00-20130913**	**LDCA-PW-1802-02-20130913**	**Benchmark**
SAMPLE DATE	**for Tap Water**	**3/25/2014**	**12/18/2014**	**7/22/2015**	**4/11/2016**	**3/25/2014**	**12/18/2014**	**7/22/2015**	**4/11/2016**	**9/13/2013**	**9/13/2013**	
POLYCYCLIC AROMATIC HYDROCARBONS (UG/L)												
2-METHYLNAPHTHALENE	3.6	--	0.10 U	0.16	--	0.10 U	0.023 J	0.10 U	--	0.0069 J	0.0081 J	4.7
ACENAPHTHENE	530	0.10 U	0.043 J	0.10 U	--	--	0.19	0.10 U	--	0.10 U	0.014 J	5.8
ACENAPHTHYLENE		0.10 U	0.15	0.12	--	--	0.055 J	0.10 U	--	0.10 U	0.10 U	
ANTHRACENE	1800	--	0.10 U	0.57	--	--	0.10 U	0.71	--	0.011 J	**0.021 J**	0.012
BENZO(A)ANTHRACENE	0.012	--	**0.043 J**	0.10 U	--	0.10 U	0.10 U	**0.096 J**	--	0.012 J	0.017 J	0.018
BENZO(B)FLUORANTHENE	0.25	--	0.10 UJ	0.10 U	--	0.10 U	0.10 UJ	0.10 U	--	0.016 J	0.015 J	
BENZO(G,H,I)PERYLENE		--	0.10 U	0.10 U	--	--	0.10 U	0.10 U	--	0.0059 J	0.10 U	
BENZO(K)FLUORANTHENE	2.5	0.10 U	0.10 U	0.10 U	--	--	0.10 U	0.10 U	--	0.0075 J	0.10 U	
CHRYSENE	25	--	0.10 U	0.10 U	--	--	0.10 U	0.10 U	--	0.016 J	0.019 J	
FLUORANTHENE	800	0.10 U	0.018 J	0.10 U	--	0.10 U	0.021 J	0.21	--	0.031 J	**0.046 J**	0.04
FLUORENE	290	0.16	0.10 U	0.10 U	--	0.41	0.35	0.098 J-	--	0.10 U	0.10 U	3
INDENO(1,2,3-CD)PYRENE	0.25	0.10 U	0.10 U	0.10 U	--	--	0.10 U	0.10 U	--	0.0065 J	0.10 U	
NAPHTHALENE	0.17	0.10 U	0.10 U	0.17	--	0.10 U	0.10 U	0.10 U	--	0.023 J	0.028 J	1.1
PENTACHLOROPHENOL	0.041	0.20 U	--	**0.61**	--	--	--	**0.19 J**	--	0.11 J	0.042 J	0.5
PHENANTHRENE		0.10 U	0.10 U	0.10 U	--	--	0.017 J	0.28	--	0.018 J	0.056 J	0.4
PYRENE	120	0.10 U	0.10 UJ	0.10 UJ	--	0.10 U	0.10 UJ	0.17	--	**0.052 J**	**0.09 J**	0.025
METALS (UG/L)												
ALUMINUM	20000	20 U	20 U	2.8 J	--	20 U	20 U	7.5 J	--	75.9	20.5	87
ANTIMONY	7.8	2 U	2 U	0.14 J	--	2 U	2 U	0.14 J	--	2 U	2 U	30
ARSENIC	0.052	**5.5**	**9.9**	**8.9**	--	**28.7**	**34.7**	**32.7**	--	1.1 J+	0.76 J+	5
BARIUM	3800	253	373	353	--	266	272	307	--	**52.1 J**	**63.1 J**	4
BORON	4000	2950	3320	--	--	1770	1530	--	--	**30.7**	**42.8**	1.6
CALCIUM		23600	35600	40600	--	37400	40400	47800	--	22200	38300	116000
CHROMIUM	44	3.9	2.3	1.7 J	--	5.3	3.2	3	--	0.39 J	0.21 J	85
COBALT	6	**10.2**	**8**	**8.7**	--	**11.5**	**6.5**	**7.2**	--	0.34 J	0.93 J	23
COPPER	800	2.8 U	0.33 J	0.41 J	--	5.1	2 U	2 U	--	5.3	0.62 J	9
CYANIDE	1.5	**3.9 J**	10 UJ	**18.3 J**	--	**4.3 J**	10 UJ	**11.6 J**	--	10 U	10 U	5
IRON	14000	9210 J	12300	13700 J	--	**46000 J**	**37200**	**45300 J**	--	293	49.6 J	300
LEAD	15	1 U	1 U	0.068 J	--	1 U	1 UJ	0.033 J	--	**2.6**	**7.6**	2.5
MAGNESIUM		66500	96800	101000	--	52600	59200	62700	--	7730	13900	82000
MANGANESE	430	321	304	407	--	**857**	**757**	**851**	--	**147**	**138**	120
MERCURY	0.63	0.20 U	0.20 U	0.021 J+	--	0.20 U	0.20 U	0.018 J+	--	0.20 U	**0.047 J**	0.026
NICKEL	390	14	14.9 J	14.9	--	9.7	7.2 J	7.3	--	1.1	1.7	52
POTASSIUM		61100	87500	85500	--	40000	48800	47300	--	3820	4470	53000
SELENIUM	100	5 U	5 U	5 U	--	5 U	0.87 J	0.76 J	--	0.50 J	0.30 J	1
SODIUM		109000	160000	142000	--	130000	133000	142000	--	19300	28400	680000
VANADIUM	86	5 UJ	0.62 J-	0.73 J	--	5.8 J	5	5.1	--	2.6 U	5.2 U	20
ZINC	6000	4.4 U	4.1 J	1.4 J	--	6	2 UJ	1.9 J	--	13.5 J	32.8 J	120
PESTICIDES (UG/L)												
4,4'-DDD	0.032	0.10 U	0.00025 J	0.00097 U	--	0.10 U	0.0019 J	0.00228 J	--	0.01 U	0.01 U	0.011
4,4'-DDE	0.046	0.10 U	0.0012 J	0.00097 U	--	0.10 U	0.00069 J	0.00099 U	--	0.01 U	0.01 U	
4,4'-DDT	0.23	0.10 U	0.0037 J	0.00097 U	--	0.10 U	0.0017 J	0.00099 U	--	**0.0021 J**	**0.0016 J**	0.0005
ALDRIN	0.00092	0.05 U	**0.0022 J**	0.00097 U	--	**0.039 J**	0.00051 J	0.00198 U	--	0.005 U	0.005 U	3
ALPHA-BHC	0.0072	0.05 U	0.00093 J	0.00097 U	--	0.05 U	0.00061 J	0.00099 U	--	0.001 U	0.001 U	
ALPHA-CHLORDANE	0.02	0.05 U	0.0005 J	0.00097 U	--	0.05 U	0.00029 J	0.00099 U	--	**0.0027 J**	0.0016 J	0.0022
BETA-BHC	0.025	0.05 U	0.001 U	0.00097 U	--	**0.03 J**	0.00093 U	0.00099 U	--	0.001 U	0.001 U	
DELTA-BHC	0.0071	**0.034 J**	0.00047 J	0.00097 U	--	0.05 U	0.00065 J	0.00099 U	--	0.005 U	0.005 U	141

Table 4-26
Comparison Between Pore Water and Shallow Groundwater Samples
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

	Groundwater									Pore Water		
LOCATION	**RSL**	**MW-07D**	**MW-07D**	**MW-07D**	**MW-07D**	**MW-07S**	**MW-07S**	**MW-07S**	**MW-07S**	**PW-1802**	**PW-1802**	**BTAG**
SAMPLE ID	**Screening Level**	**LDCA-MW07D-0314**	**LDCA-MW07D-1014**	**LDCA-MW07D-0615**	**LDCA-MW07D-0416**	**LDCA-MW07S-0314**	**LDCA-MW07S-1014**	**LDCA-MW07S-0615**	**LDCA-MW07S-0416**	**LDCA-PW-1802-00-20130913**	**LDCA-PW-1802-02-20130913**	**Benchmark**
SAMPLE DATE	**for Tap Water**	**3/25/2014**	**12/18/2014**	**7/22/2015**	**4/11/2016**	**3/25/2014**	**12/18/2014**	**7/22/2015**	**4/11/2016**	**9/13/2013**	**9/13/2013**	
DIELDRIN	0.0018	0.10 U	0.00042 J	0.00682 U	--	**0.022 J**	0.0015 J	0.00198 U	--	0.014 J	0.0066	0.056
ENDOSULFAN I	100	0.05 U	0.005 U	0.00097 U	--	0.05 U	0.001 J	0.00099 U	--	0.005 U	0.005 U	0.051
ENDOSULFAN II	100	0.025 J	0.0017 J	0.00195 U	--	0.10 U	0.0032 J	0.00396 U	--	0.0031 J	0.0019 J	0.051
ENDOSULFAN SULFATE	100	0.10 U	0.00037 J	0.00195 U	--	0.10 U	0.0093 U	0.00198 U	--	0.01 U	0.01 U	0.051
ENDRIN	2.3	0.10 U	0.00023 J	0.00195 U	--	0.10 U	0.0093 U	0.00198 U	--	0.01 U	0.01 U	0.036
ENDRIN ALDEHYDE	2.3	0.10 U	0.0028 J	0.0039 U	--	0.10 U	0.0011 J	0.00198 U	--	0.01 U	0.01 U	0.036
ENDRIN KETONE	2.3	0.10 U	0.00022 J	0.0039 U	--	0.10 U	0.00019 J	0.00198 U	--	0.0019 J	0.0016 J	0.036
GAMMA-BHC (LINDANE)	0.042	0.05 U	0.00038 J	0.00097 U	--	0.05 U	0.00078 J	0.00099 U	--	0.005 U	0.005 U	0.01
GAMMA-CHLORDANE	0.02	0.05 U	0.00021 J	0.00097 U	--	0.014 J	0.00087 J	0.00099 U	--	0.0021 J	0.005 U	0.0022
HEPTACHLOR	0.0014	0.05 U	0.00079 J	0.00097 U	--	0.05 U	0.00064 J	0.00099 U	--	0.001 U	0.001 U	0.0019
HEPTACHLOR EPOXIDE	0.0014	0.05 U	0.002 U	0.0039 U	--	0.05 U	0.0005 J	0.00198 U	--	**0.0021**	0.002 U	0.0019
METHOXYCHLOR	37	0.50 U	0.007 J	0.0039 U	--	0.079 J	0.0025 J	0.00198 U	--	0.05 U	0.05 U	0.019
SEMIVOLATILES (UG/L)												
1,4-DIOXANE	0.46	**4.7**	--	**6.3**	--	**2.3**	--	**18**	--	2.5 UJ	2.5 UJ	
ACETOPHENONE	1900	5 U	5 U	10 U	--	4.2 J	5 U	10 U	--	5 U	5 U	
ANTHRACENE	1800	5 U	0.44 U	5 U	--	5 U	0.44 U	0.72 J	--	5 U	5 U	0.012
BENZALDEHYDE	19	5 U	5 UJ	10 U	--	5 U	5 UJ	1.1 J	--	5 U	5 U	
FLUORENE	290	--	5 U	5 U	--	--	0.35 J	5 U	--	5 U	5 U	3

Table 4-26
Comparison Between Pore Water and Shallow Groundwater Samples
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

		Groundwater				Pore Water			
LOCATION	**RSL**	**MW-06**	**MW-06**	**MW-06**	**MW-06**	**PW-1601**	**PW-1601**	**PW-1601**	**BTAG**
SAMPLE ID	**Screening Level**	**LDCA-MW06-0314**	**LDCA-MW06-1014**	**LDCA-MW06-0615**	**LDCA-MW06-0416**	**LDCA-PW-1601-00-20130911**	**LDCA-PW-1601-02-20130911**	**LDCA-PW-1601-00-0216**	**Benchmark**
SAMPLE DATE	**for Tap Water**	**3/11/2014**	**12/18/2014**	**7/15/2015**	**4/11/2016**	**9/11/2013**	**9/11/2013**	**2/25/2016**	
POLYCYCLIC AROMATIC HYDROCARBONS (UG/L)									
2-METHYLNAPHTHALENE	3.6	--	0.093 J	0.22	--	0.0068 J	0.079 J	--	4.7
ACENAPHTHENE	530	--	1.6	3.1	--	0.056 J	0.14	--	5.8
ACENAPHTHYLENE		0.10 U	0.34	0.10 U	--	0.0078 J	0.059 J	--	
ANTHRACENE	1800	--	0.64 J	0.22	--	**0.019 J**	**0.16**	--	0.012
BENZO(A)ANTHRACENE	0.012	--	**0.041 J**	0.10 U	--	0.015 J	**0.052 J**	--	0.018
BENZO(B)FLUORANTHENE	0.25	--	0.10 R	0.10 U	--	0.015 J	0.10 U	--	
BENZO(G,H,I)PERYLENE		--	0.10 R	0.10 U	--	0.0075 J	0.10 U	--	
BENZO(K)FLUORANTHENE	2.5	0.10 U	0.10 R	0.10 U	--	0.0063 J	0.10 U	--	
CHRYSENE	25	0.10 U	0.10 U	0.10 U	--	0.015 J	0.025 J	--	
FLUORANTHENE	800	0.12	0.066 J	0.14	--	**0.047 J**	**0.078 J**	--	0.04
FLUORENE	290	--	0.74	1.1	--	0.10 U	0.10 U	--	3
INDENO(1,2,3-CD)PYRENE	0.25	--	0.10 R	0.10 U	--	0.0068 J	0.10 U	--	
NAPHTHALENE	0.17	--	0.10 U	0.14	--	0.10 U	0.10 U	--	1.1
PHENANTHRENE		0.09 J	0.20 J	0.49	--	0.023 J	0.053 J	--	0.4
PYRENE	120	0.10 U	0.10 UJ	0.18	--	**0.084 J**	**0.095 J**	--	0.025
DIOXINS/FURANS (PG/L)									
1,2,3,4,6,7,8,9-OCDD	400	190	547	--	--	100 U	479	--	
1,2,3,4,6,7,8,9-OCDF		0.615 U	6.25 Z	--	--	100 U	100 U	--	
TEQ	0.1	0.057	**0.17**	--	--	10 U	0.14	--	
TEQ BIRD		0.019	0.06	--	--	10 U	0.05	--	
TEQ BIRD HALFND		1.38	1.00	--	--	10 U	77.1	--	
TEQ FISH		0.019	0.06	--	--	10 U	**0.05**	--	0.003
TEQ FISH HALFND		1.20	0.88	--	--	10 U	**67.6**	--	0.003
TEQ HALFND	0.1	**1.12**	**0.89**	--	--	10 U	57.2	--	
TEQ MAMMAL		--	0.166	--	--	0.00 U	0.144	--	
TOTAL HPCDD		0.00 U	106	--	--	0.39 U	0.41 U	--	
TOTAL HXCDD		0.00 U	9.46 J	--	--	0.33 U	0.35 U	--	
TOTAL HXCDF		0.00 U	2.21 Z	--	--	0.22 U	0.21 U	--	
TOTAL PECDD		0.00 U	1.56 Z	--	--	0.59 U	0.60 U	--	
TOTAL TCDF		0.00 U	1.35 J	--	--	0.55 U	0.47 U	--	
METALS (UG/L)									
ALUMINUM	20000	20 UJ	29.3	23.1	--	18.4 J	26.9	**110**	87
ARSENIC	0.052	1 U	**2.8**	**1.5**	--	1.6 J+	3.5 J+	4.5	5
BARIUM	3800	326	750	530 J	--	**96.8 J**	**96.2 J**	**218**	4
BORON	4000	1490	3680	--	--	**48.1**	**805**	--	1.6
CALCIUM		143000 J	156000	175000 J	--	36800	36200	85100	116000
CHROMIUM	44	5.4 J	24.9	11.7	--	0.26 J	7.2	13.8	85
COBALT	6	**7.5**	**11.3**	6	--	0.54 J	2.1	4.7	23
COPPER	800	5	0.61 J	2 U	--	0.92 J	0.11 J-	**30.7**	9
IRON	14000	**15700 J**	**22900**	**18800 J**	--	**1080**	**2030**	**5700**	300
LEAD	15	1.8	1.5	1 U	--	1.9	1.4	1.8	2.5
MAGNESIUM		60300	104000	85700 J	--	14500	19900	61900	82000
MANGANESE	430	**442 J**	**622**	**484**	--	**433**	**213**	**282**	120
MERCURY	0.63	0.20 U	0.084 J-	0.025 J	--	0.20 U	0.20 U	--	0.026
NICKEL	390	4.8 J	10.4	5.2 J	--	1.2	3	10.5	52
POTASSIUM		35100	100000	71800 J	--	4740	23200	**101000**	53000
SELENIUM	100	0.38 J	5 U	5 U	--	0.64 J	**2.6 J**	1 U	1
SODIUM		127000	437000	337000 J	--	34700	144000	469000	680000
VANADIUM	86	0.89 J	6	3.2	--	5.2 U	6.5 J	5 U	20
ZINC	6000	8.4 J	5.5	5.2	--	7.6 J	2 J	6.6	120
FILTERED METALS (UG/L)									
ALUMINUM	20000	20 UJ	20 U	18.5	--	--	--	20 U	87
ANTIMONY	7.8	2 U	2 U	0.16	--	--	--	2 U	30
ARSENIC	0.052	1 U	**2.5**	**1.5**	--	--	--	3.7	5
BARIUM	3800	346	620	516	--	--	--	**196**	4
CALCIUM		151000	180000	168000	--	--	--	75500	116000
CHROMIUM	44	6.3 J	18.8	11.1	--	--	--	12.6 B	85
COBALT	6	1 U	**8.7 J**	5.8	--	--	--	4.2	23
COPPER	800	5.4	2 UJ	0.19	--	--	--	**22.8**	9
IRON	14000	**15900**	**18200 J**	**18300**	--	--	--	**4870**	300
LEAD	15	3.8	1 U	0.037	--	--	--	1 U	2.5
MAGNESIUM		57400	84100	86800	--	--	--	53500	82000
MANGANESE	430	**447 J**	**496**	**484**	--	--	--	**233**	120
NICKEL	390	8.5	8.2 J	5	--	--	--	8.8	52
POTASSIUM		37600	87000	71800	--	--	--	**87500**	53000
SELENIUM	100	5 U	5 U	5 U	--	--	--	**2.1**	1
SODIUM		129000	540000	338000	--	--	--	436000	680000
VANADIUM	86	5 U	4.7	3	--	--	--	5.4 J	20
ZINC	6000	9.9 J	2	2	--	--	--	5.3	120

Table 4-26
Comparison Between Pore Water and Shallow Groundwater Samples
Lower Darby Creek Area (LDCA)
Clearview Landfill - Operable Unit 3 (OU-3)

LOCATION	RSL	MW-06	MW-06	MW-06	MW-06	PW-1601	PW-1601	PW-1601	BTAG
SAMPLE ID	Screening Level	LDCA-MW06-0314	LDCA-MW06-1014	LDCA-MW06-0615	LDCA-MW06-0416	LDCA-PW-1601-00-20130911	LDCA-PW-1601-02-20130911	LDCA-PW-1601-00-0216	Benchmark
SAMPLE DATE	for Tap Water	3/11/2014	12/18/2014	7/15/2015	4/11/2016	9/11/2013	9/11/2013	2/25/2016	
PESTICIDES (UG/L)									
4,4'-DDD	0.032	0.10 U	0.00083 J	0.00097 U	--	0.01 U	0.0028 J	--	0.011
4,4'-DDE	0.046	0.10 U	0.0026 J	0.00097 U	--	0.01 U	0.01 U	--	
4,4'-DDT	0.23	0.10 U	0.0061 J	0.00097 U	--	**0.015 J**	**0.0053 J**	--	0.0005
ALDRIN	0.00092	0.05 U	0.0007 J	0.0029 U	--	0.005 U	0.005 U	--	3
ALPHA-BHC	0.0072	0.05 U	0.00038 J	0.00097 U	--	0.001 U	0.0015	--	
ALPHA-CHLORDANE	0.02	0.05 U	0.00079 J	0.00097 U	--	**0.0035 J**	0.005 U	--	0.0022
BETA-BHC	0.025	0.05 U	0.001 R	0.00097 U	--	0.001 U	0.0031 J	--	
DELTA-BHC	0.0071	0.05 U	0.00033 J	0.00097 U	--	0.005 U	0.005 U	--	141
DIELDRIN	0.0018	0.10 U	0.0016 J	0.0029 U	--	0.02	0.0034 J	--	0.056
ENDOSULFAN I	100	0.05 U	0.0011 J	0.00097 U	--	0.0013 J	0.005 U	--	0.051
ENDOSULFAN II	100	0.10 U	0.0017 J	0.00386 U	--	0.0047 J	0.0019 J	--	0.051
ENDRIN	2.3	0.10 U	0.00019 J	0.00483 U	--	0.01 U	0.01 U	--	0.036
ENDRIN ALDEHYDE	2.3	0.10 U	0.0012 J	0.00193 U	--	0.01 U	0.01 U	--	0.036
ENDRIN KETONE	2.3	0.10 U	0.0099 R	0.00193 U	--	0.0017 J	0.01 U	--	0.036
GAMMA-BHC (LINDANE)	0.042	0.05 U	0.0021 J	0.00097 U	--	0.005 U	0.005 U	--	0.01
GAMMA-CHLORDANE	0.02	0.05 U	0.005 R	0.00097 U	--	**0.0025 J**	**0.0041 J**	--	0.0022
HEPTACHLOR	0.0014	0.05 U	**0.01 J**	0.00097 U	--	0.0011 J	**0.0036**	--	0.0019
HEPTACHLOR EPOXIDE	0.0014	0.05 U	0.0007 J	0.0029 U	--	0.002 U	0.002 U	--	0.0019
METHOXYCHLOR	37	0.50 U	0.0028 J	0.0029 U	--	0.05 U	0.0061 J	--	0.019
SEMIVOLATILES (UG/L)									
1,4-DIOXANE	0.46	**11**	--	**77**	--	2.5 U	20	--	
ACENAPHTHENE	530	1.4	2.4 U	--	--	5 U	5 U	--	5.8
ANTHRACENE	1800	5 U	0.44 J	--	--	5 U	5 U	--	0.012
DIETHYL PHTHALATE	15000	4 J	5 U	5 U	--	5 U	5 U	--	210

Footnotes:

-- = The chemical was not analyzed or no value was available.

Data Qualifiers:

J = The chemical was detected but the concentration reported is an estimated value.

J+ = The chemical was detected but the concentration reported is a biased high value

J- = The chemical was detected but the concentration reported is a biased low value

U = The chemical was not detected.

R = The chemical was rejected.

Z = The dioxin/furan result is considered the estimated maximum possible concentration

Highlighted and bolded values exceed the respective screening criteria

TABLE 5-1

PHYSICAL AND CHEMICAL PROPERTIES OF ORGANIC SITE CONTAMINANTS
LOWER DARBY CREEK AREA (LDCA)
CLEARVIEW LANDFILL - OU 3 GROUNDWATER

Chemical	Specific Gravity (@ 20/4°C)	Vapor Pressure (mm Hg @ 25°C)	Water Solubility (mg/L @ 25°C)	Octanol/Water Partition Coefficient (unitless)	Organic Carbon Partition Coefficient (unitless)	K_d Distribution Coefficient (unitless)	Henry's Law Constant (atm-m^3/mole)	Bioconcentration Factor (L/kg)	Mobility Index log [(solubility *VP)/Koc]
VOCs - Monocyclic Aromatics									
1,2-Dichlorobenzene	1.31	1.4E+00	1.6E+02	2.7E+03	3.8E+02	NA	1.9E-03	NA	-0.26
1,4-Dichlorobenzene	1.25 (55°C)	1.7E+00	8.1E+01	2.8E+03	3.8E+02	57	2.4E-03	1.8E+03	-0.42
Benzene	0.88	9.5E+01	1.8E+03	1.3E+02	1.5E+02	22	5.6E-03	1.0E+04	3.07
Chlorobenzene	1.11	1.2E+01	5.0E+02	6.9E+02	2.3E+02	35	3.1E-03	4.1E+03	1.41
Ethylbenzene	0.86	9.6E+00	1.7E+02	1.4E+03	4.5E+02	67	7.9E-03	NA	0.56
VOCs - Halogenated Aliphatics									
1,1,2-Trichloroethane	1.4	2.3E+01	4.6E+03	7.8E+01	6.1E+01	9.2	8.2E-04	NA	3.24
1,1-Dichloroethane	1.2	2.3E+02	5.0E+03	6.2E+01	3.2E+01	4.8	5.6E-03	NA	4.56
1,2-Dichloroethane	1.2	7.9E+01	8.6E+03	3.0E+01	4.0E+01	6	1.2E-03	2.0E+00	4.23
1,2-Dibromo-3-Chloropropane	2.09	5.8E-01	1.2E+03	9.1E+02	1.2E+02	17	1.5E-04	NA	0.79
Chloroform	1.5	2.0E+02	8.0E+03	9.3E+01	3.2E+01	4.8	3.7E-03	6.9E+02	4.69
cis-1,2-Dichloroethene	1.3	2.0E+02	6.4E+03	7.2E+01	4.0E+01	6	4.1E-03	NA	4.51
Trichloroethene	1.46	6.9E+01	1.3E+03	2.6E+02	6.1E+01	9.2	9.9E-03	1.7E+01	3.16
Vinyl chloride	0.91	3.0E+03	8.8E+03	2.4E+01	2.2E+01	3.3	2.8E-02	NA	6.08
PAHs									
2-Methylnaphthalene	1.0	5.5E-02	2.5E+01	7.2E+03	2.5E+03	3.7E+02	5.2E-04	2.3E+04	-3.26
Benzo(a)anthracene	1.274	2.1E-07	9.4E-03	5.8E+05	1.8E+05	2.6E+04	1.2E-05	1.0E+04	-13.95
Benzo(a)pyrene	1.351	5.5E-09	1.6E-03	1.3E+06	5.9E+05	8.9E+04	4.6E-07	9.6E+05	-16.82
Benzo(b)fluoranthene	NA	5.0E-07	1.5E-03	6.0E+05	6.0E+05	NA	6.6E-07	1.4E+05	-14.90
Benzo(k)fluoranthene	NA	9.7E-10	8.0E-04	1.3E+06	5.9E+05	8.9E+04	5.8E-07	1.3E+04	-17.88
Dibenzo(a,h)anthracene	NA	9.6E-10	2.5E-03	5.6E+06	1.9E+06	2.9E+03	1.4E-08	5.0E+04	-17.91
Indeno(1,2,3-cd)pyrene	NA	1.3E-10	1.9E-04	5.0E+06	2.0E+06	2.9E+05	3.5E-07	NA	-19.91
Naphthalene	1.0	8.5E-02	3.1E+01	2.0E+03	1.5E+03	2.3E+02	4.4E-04	1.3E+05	-2.77
SVOCs									
Bis(2-Ethylhexyl) phthalate	0.98	1.4E-07	2.7E-01	4.0E+07	1.2E+05	1.8E+04	2.7E-07	1.0E+05	-12.49
1,4-Dioxane	1.03	3.8E+01	1.0E+06	5.4E-01	2.6E+00	4.0E-01	4.8E-06	NA	7.16
2,6-Dinitrotoluene	1.28	5.7E-04	1.8E+02	1.3E+02	5.9E+02	NA	7.5E-07	NA	-3.76
Bis(2-chloroethyl)ether	1.22	1.6E+00	1.7E+04	1.9E+01	3.2E+01	NA	1.7E-05	NA	2.92
Pentachlorophenol	1.98	1.1E-04	1.4E+01	1.3E+05	5.9E+02	7.5E+02	2.5E-08	4.5E+04	-5.58
PESTICIDES									
4,4'-DDD	NA	1.4E-06	9.0E-02	1.0E+06	1.2E+05	1.7E+04	6.6E-06	1.6E+06	-11.99
4,4'-DDE	1.4	6.0E-06	4.0E-02	3.2E+06	1.2E+05	1.7E+04	4.2E-05	5.1E+05	-11.69
Aldrin	1.6	1.2E-04	1.7E-02	3.2E+06	8.2E+04	1.2E+04	4.4E-05	1.4E+05	-10.60
beta-BHC	1.89	3.6E-07	2.4E-01	6.0E+03	2.8E+03	4.2E+02	4.4E-07	1.5E+03	-10.51
delta-BHC	NA	3.5E-05	3.1E+01	1.5E+06	2.8E+03	NA	5.1E-06	NA	-6.41
Dieldrin	1.75	5.9E-06	2.0E-01	2.5E+05	2.0E+04	3.0E+03	1.0E-05	5.7E+05	-10.24
gamma-BHC	NA	4.2E-05	7.3E+00	5.2E+03	2.8E+03	4.2E+02	5.1E-06	2.9E+05	-6.96
Heptachlor	1.57	4.0E-04	1.8E-01	1.3E+06	4.1E+04	6.2E+03	2.9E-04	2.3E+04	-8.76
Heptachlor Epoxide	1.91	2.0E-05	2.0E-01	9.5E+04	1.0E+04	1.5E+03	2.1E-05	1.4E+04	-9.41
PCBs									
PCB-77	NA	1.6E-05	5.7E-04	4.3E+06	7.8E+04	NA	9.4E-06	NA	-12.92
PCB-81	1.44	8.5E-06	3.2E-02	2.2E+06	7.8E+04	NA	2.2E-04	NA	-11.46
PCB-105	1.52	6.5E-06	3.4E-03	6.2E+06	1.3E+05	NA	2.8E-04	NA	-12.77
PCB-114	1.52	5.5E-06	1.6E-02	9.5E+06	1.3E+05	NA	9.2E-05	NA	-12.17

TABLE 5-1

PHYSICAL AND CHEMICAL PROPERTIES OF ORGANIC SITE CONTAMINANTS
LOWER DARBY CREEK AREA (LDCA)
CLEARVIEW LANDFILL - OU 3 GROUNDWATER

Chemical	Specific Gravity (@ 20/4°C)	Vapor Pressure (mm Hg @ 25°C)	Water Solubility (mg/L @ 25°C)	Octanol/Water Partition Coefficient (unitless)	Organic Carbon Partition Coefficient (unitless)	K_d Distribution Coefficient (unitless)	Henry's Law Constant (atm-m^3/mole)	Bioconcentration Factor (L/kg)	Mobility Index log [(solubility *VP)/Koc]
PCB-118	1.52	9.0E-06	1.3E-02	1.3E+07	1.3E+05	NA	2.9E-04	NA	-12.03
PCB-123	1.52	5.5E-06	1.6E-02	9.5E+06	1.3E+05	NA	1.9E-04	NA	-12.17
PCB-156/157	1.59	1.6E-06	5.3E-03	4.0E+07	2.1E+05	NA	1.4E-04	NA	-13.40
PCB-167	1.59	5.8E-07	2.2E-03	3.2E+07	2.1E+05	NA	6.9E-05	NA	-14.21
PCB-189	1.59	1.3E-07	7.5E-04	1.9E+08	3.5E+05	NA	5.1E-05	NA	-15.55
DIOXINS/FURANS									
TCDDs	NA	1.40E-08	3.30E-04	3.2E+06	1.1E+02 - 3.2E+08	NA	1.7E-05	5.4E+03 - 7.9E+05	-16.61
PeCDDs	NA	5.60E-10	1.18E-04	4.0E+06	7.1E+04 - 2.4E+06	NA	2.6E-06	1.9E+05	-18.80
HxCDDs	NA	4.40E-11	4.40E-06	2.0E+07	1.0E+05 - 1.3E+07	NA	1.1E-05	1.7E+03 - 1.0E+05	-21.77
HpCDDs	NA	3.20E-11	2.4E-06	1.0E+08	3.0E+05 - 6.3E+07	NA	1.3E-05	5.1E+02 - 4.8E+04	-22.75
OCDD	NA	8.25E-13	7.40E-08	1.6E+08	8.3E+05 - 7.9E+07	NA	6.8E-06	7.9E+01 - 1.3E+04	-26.12
TCDFs	NA	2.50E-08	4.2E-4 (22.7°C)	1.6E+06	1.6E+05 - 3.2E+07	NA	1.4E-05	2.5E+03 - 6.6E+04	-17.33
PeCDFs	NA	2.70E-09	2.4E-4 (22.7°C)	2.5E+06	3.9E+05 - 2.5E+07	NA	5.0E-06	5.0E+03 - 1.4E+05	-18.68
HxCDFs	NA	2.80E-10	1.3E-5 (22.7°C)	1.0E+07	2.5E+07	NA	1.1E-05	8.9E+04	-21.84
HpCDFs	NA	4.70E-11	1.4E-6 (22.7°C)	2.5E+07	1.0E+05 - 7.9E+07	NA	1.4E-05	2.9E+04	-22.63
OCDF	NA	3.75E-12	1.16E-06	1.0E+08	1.0E+06 - 2.5E+07	NA	1.9E-06	5.9E+02 - 7.9E+03	-24.06
2,3,7,8-TCDD	NA	1.5E-09	2.0E-04	6.3E+06	2.5E+05	3.7E+04	5.0E-05	8.6E+04	-17.92
PFCS									
Perfluorooctanoic Acid	1.79	5.3E-01	9.5E+03	NA	1.2E+02	NA	NA	NA	1.64
Perfluorooctane Sulfonic Acid	1.84	2.0E-03	6.8E+02	NA	3.7E+02	NA	NA	NA	-2.44

Notes:

NA = not available   atm-m^3/mole = atmosphere cubic meter per mole

^{o}C = degree Celsius   Koc = Organic carbon partition coefficient   VP = vapor pressure   L/kg = liters per kilogram

Kow = Octanol/water partition coefficient

1 Sources of information, in order of preference:

1 - USEPA, 2016, Regional Screening Level (RSL) Table, May.

2 - Risk Assessment Information System Website: https://rais.ornl.gov/ visted on September 4, 2016.

USEPA, 2016. Superfund Chemical Data Matrix. Website: https://www.epa.gov/superfund/superfund-chemical-data-matrix-scdm visited on September 4, 2016.

USEPA, 1992. Handbook for RCRA Groundwater Monitoring Constituents:Chemical and Physical Properties.

Mabey et al., 1982. Aquatic Fate Process Data for Organic Priority Pollutants.

TABLE 5-2
PHYSICAL AND CHEMICAL PROPERTIES OF INORGANIC SITE CONTAMINANTS
LOWER DARBY CREEK AREA (LDCA)
CLEARVIEW LANDFILL - OU 3 GROUNDWATER

Chemical	Molecular Weight (g/mol)[1]	Density (g/cm^3)[1]	Vapor Pressure (25 °C) (mm Hg)[1]	Solubility (25 °C) (mg/L)[1]	Henry's Law Constant (25 °C) ($atm\text{-}m^3/mol$)[1]	Soil-Water K_d (mL/gm)[1]	Log K_{ow} (unitless)[1]	Bioconcentration Factor (mL/gm)[2]
Aluminum	26.98	2.70	NA	NA	NA	10	NA	6,600
Antimony	124.77	6.68	NA	NA	NA	45	NA	1
Arsenic	77.95	4.90	NA	NA	NA	29	NA	12,000
Barium	139.36	3.62	NA	NA	NA	41	NA	NA
Beryllium	11.03	1.85	NA	NA	NA	790	NA	19
Boron	13.84	2.34	NA	NA	NA	3	NA	18
Cadmium	112.40	8.69	NA	NA	NA	75	NA	200,000
Chromium (III)	52.00	5.22	NA	NA	NA	1,800,000	NA	120
Chromium (VI)	52.00	5.22	NA	NA	NA	19	NA	190
Cobalt	58.93	8.86	NA	NA	NA	45	NA	45
Copper	63.55	8.96	NA	NA	NA	430	NA	88,000
Cyanide	26.02	0.70	3.1E+02	95,400	1.0E-04	9.9	NA	NA
Iron	55.85	7.87	NA	NA	NA	25	NA	1,200
Lead	207.20	11.30	NA	NA	NA	900	NA	530,000
Manganese	54.94	7.30	NA	NA	NA	65	NA	840,000
Mercury	200.59	13.53	2.0E-03	0.06	8.6E-03	52	6.2E-01	27,000
Nickel	58.71	8.90	NA	NA	NA	65	NA	77,000
Silver	107.87	10.50	NA	NA	NA	8.3	NA	28
Thallium	205.38	11.80	NA	NA	NA	71	NA	130
Vanadium	50.94	6.00	NA	NA	NA	1,000	NA	17,000
Zinc	65.37	7.13	NA	NA	NA	62	NA	78,000

Notes:

1 - USEPA, 2016, Regional Screening Level (RSL) Table, May.

2 - USEPA, 2016. Superfund Chemical Data Matrix. Website: https://www.epa.gov/superfund/superfund-chemical-data-matrix-scdm visited on September 4, 2016.

NA Not available. mm Hg - millimeters mercury

K_d - Soil-water distribution coefficient. mg/L - milligrams per liter

g/mol - grams per mole $atm\text{-}m^3/mol$ - atmosphere cubic meters per mole

°C - degrees Celsius mL/gm - milliliters per gram

Table 6-1
Summary of Human Health Risks for Lower Darby Creek Area
Reasonable Maximum Exposures
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Receptor	Cumulative Cancer Risk	Maximum Target Organ HI	Population % Lead > 10 ug/dL	Contributors to unacceptable risk if cancer risk >1E-6, noncancer HQ > 0.1, or blood lead level > 10 ug/dL for > 5% of population. Lifetime receptor -- only cancer risk COCs; child or adult -- only noncancer risk COCs.
GROUNDWATER INSIDE LANDFILL				
Lifetime Resident (Direct Contact)	1E-02	--	--	2,3,7,8-TCDD TEQs, Trichloroethene, Benzene, Chromium, Dioxin-like PCBs, Nondioxin-like PCBs, Arsenic, Benzo(a)pyrene, 1,4-Dioxane, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Aldrin, Dieldrin, Benzo(a)anthracene, delta-BHC, Pentachlorophenol, Benzo(k)fluoranthene, Bis(2-ethylhexyl)phthalate, beta-BHC, Heptachlor
Lifetime Resident (Vapor Intrusion)	8E-05	9	--	Mercury
Child Resident	(see lifetime)	205	82% > 10 ug/dL	Antimony, Zinc, Aluminum, Manganese, Mercury, Trichloroethene, Arsenic, 2,3,7,8-TCDD Equivalents, Pentadecafluorooctanoic Acid, Perfluorooctane Sulfonic Acid, Dioxin-Like PCBs, Boron, Beryllium, Copper, Iron, Thallium, Cyanide, Silver, Vanadium, Cobalt, 1,4-Dioxane, Barium, Cadmium, Chromium, Lead
Adult Resident	(see lifetime)	141	--	Antimony, Zinc, Aluminum, Manganese, Mercury, Trichloroethene, Arsenic, 2,3,7,8-TCDD Equivalents, Pentadecafluorooctanoic Acid, Perfluorooctane Sulfonic Acid, Dioxin-Like PCBs, Boron, Cyanide, Beryllium, Copper, Iron, Thallium, Silver, Vanadium, Chromium
Construction Worker	1E-04	62	--	2,3,7,8-TCDD Equivalents, Dioxin-Like PCBs, Trichloroethene, Cyanide
Industrial Worker	4E-03	65	--	2,3,7,8-TCDD Equivalents, Dioxin-Like PCBs, Nondioxin-Like PCBs, Dieldrin, Arsenic, Chromium, Cyanide, 1,4-Dioxane, Naphthalene, Aldrin
Industrial Worker (Vapor Intrusion)	2E-05	2	--	Mercury
GROUNDWATER OUTSIDE LANDFILL - SHALLOW WELLS				
Lifetime Resident	1E-03	--	--	Arsenic, Vinyl Chloride, 2,6-Dinitroluene, Chromium, 1,4-Dioxane, Benzo(a)pyrene, 1,2-Dibromo-3-Chloropropane, Bis(2-chloroethyl)ether, Pentachlorophenol, Dieldrin, 2,3,7,8-TCDD TEQs, Benzene, Dioxin-like PCBs, 1,2-Dichloroethane, Trichloroethene, Naphthalene
Lifetime Resident (Vapor Intrusion)	5E-05	1	--	None
Child Resident	(see lifetime)	25	35% > 10 ug/dL	Aluminum, Manganese, Trichloroethene, Arsenic, Pentadecafluorooctanoic Acid, Perfluorooctane Sulfonic Acid, 2,3,7,8-TCDD Equivalents, cis-1,2-Dichloroethene, Boron, Iron, Thallium, Silver, Cobalt, 2,6-Dinitrotoluene, Cyanide, Cadmium, Lead
Adult Resident	(see lifetime)	16	--	Aluminum, Manganese, Trichloroethene, Arsenic, Pentadecafluorooctanoic Acid, Perfluorooctane Sulfonic Acid, Cyanide, Iron, Thallium, Silver
Construction Worker	4E-06	9	--	Cyanide
Industrial Worker	1E-04	9	--	Vinyl Chloride, 2,6-Dinitrotoluene, Pentachlorophenol, Cyanide, Dieldrin, Chromium, Manganese, 1,2-Dibromo-3-Chloropropane, 1,2-Dichloroethane, Benzene, Trichloroethene, 1,4-Dioxane, Bis(2-Chloroethyl)Ether, Naphthalene, 2,3,7,8-TCDD TEQs, Dioxin-Like PCBs, Arsenic
Industrial Worker (Vapor Intrusion)	4E-06	0.3	--	None
GROUNDWATER OUTSIDE LANDFILL - DEEP WELLS				
Lifetime Resident	2E-03	--	--	Chromium, Vinyl Chloride, Trichloroethene, Arsenic, 1,4-Dioxane, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, 2,3,7,8-TCDD TEQs, delta-BHC, Dibenzo(a,h)anthracene.
Child Resident	(see lifetime)	56	0.27% > 10 ug/dL	Aluminum, Manganese, Trichloroethene, Iron, cis-1,2-Dichloroethene, 2,3,7,8-TCDD, Arsenic, Cadmium, Cobalt, Lead
Adult Resident	(see lifetime)	36	--	Aluminum, Manganese, Trichloroethene, Arsenic, Cyanide, Iron, Cobalt, cis-1,2-Dichloroethene
Industrial Worker	8E-05	4	--	cis-1,2-Dichloroethene, Trichloroethene
PORE WATER				
Construction Worker	2E-08	0.007	--	No COCs
Recreational User	4E-05	0.3	--	No COCs

Table 6-2
Summary of Human Health Risks for Lower Darby Creek Area
Central Tendency Exposures
Clearview Landfill Groundwater, Operable Unit 3 (OU-3)
Philadelphia and Delaware Counties, Pennsylvania

Receptor	Cumulative Cancer Risk	Maximum Target Organ HI	Contributors to unacceptable risk if cancer risk >1E-6, noncancer HQ > 0.1, or blood lead level > 10 ug/dL for > 5% of population. Lifetime receptor -- only cancer risk COCs; child or adult -- only noncancer risk COCs.
GROUNDWATER INSIDE LANDFILL			
Lifetime Resident (Direct Contact)	2E-03	--	2,3,7,8-TCDD Equivalents, Dioxin-Like PCBs, Chromium, 1,4-Dioxane, Benzo(a)pyrene, Nondioxin-Like PCBs, Arsenic, Aldrin, Dieldrin
Child Resident	(see lifetime)	79	2,3,7,8-TCDD Equivalents, Pentadecafluorooctanoic Acid, Perfluorooctane Sulfonic Acid, Dioxin-Like PCBs, Aluminum, Antimony, Manganese, Mercury, Arsenic, Boron, Thallium, Cyanide, Vanadium
Adult Resident	(see lifetime)	40	2,3,7,8-TCDD Equivalents, Perfluorooctane Sulfonic Acid, Dioxin-Like PCBs, Cyanide, Manganese, Mercury, Thallium
Construction Worker	6E-05	31	2,3,7,8-TCDD Equivalents, Dioxin-Like PCBs, Nondioxin-Like PCBs, Cyanide
Industrial Worker	5E-04	33	2,3,7,8-TCDD Equivalents, Dioxin-Like PCBs, Nondioxin-Like PCBs, Chromium, Cyanide
GROUNDWATER OUTSIDE LANDFILL - SHALLOW WELLS			
Lifetime Resident	3E-04	--	1,2-Dibromo-3-Chloropropane, Vinyl Chloride, 2,6-Dinitrotoluene, Arsenic, Chromium, 1,4-Dioxane, Bis(2-Chloroethyl)Ether, Pentachlorophenol, Dieldrin
Child Resident	(see lifetime)	10	Aluminum, Arsenic, Manganese, Pentadecafluorooctanoic Acid, Perfluorooctane Sulfonic Acid, Thallium, Trichloroethene
Adult Resident	(see lifetime)	5	Manganese, Thallium
Construction Worker	2E-06	4	Cyanide
Industrial Worker	2E-05	5	1,2-Dibromo-3-Chloropropane, Chromium, Manganese, Naphthalene, Cyanide
GROUNDWATER OUTSIDE LANDFILL - DEEP WELLS			
Lifetime Resident	5E-04	--	Vinyl Chloride, Trichloroethene, Arsenic, Chromium, 1,4-Dioxane, Dibenzo(a,h)anthracene
Child Resident	(see lifetime)	22	cis-1,2-Dichloroethene, Aluminum, Arsenic, Cobalt, Manganese, Trichloroethene
Adult Resident	(see lifetime)	11	Trichloroethene, cis-1,2-Dichloroethene, Aluminum, Manganese
Industrial Worker	1E-05	2	Trichloroethene, Chromium

Table 6-3
Semivolatile Organic Compounds (SVOCs) Detected in Pore Water (May 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

Analyte	CAS #	Unit	Summary Statistics[1]			Surface Water Screening Level[2]		Maximum EEQ[3]	LD103 5/2/2013		LD106 5/2/2013		LD108 5/2/2013		LD110 5/2/2013		LD114 5/3/2013	
			Maximum Detection	Number of Detections	Number of Exceedances	Value	Source		Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,4-Dioxane	123-91-1	ug/L	170	11	0	-		-	4.9	J	14	J	12	J	63	J	150	J
2-Methylphenol	95-48-7	ug/L	17	1	1	13		**1.3**										
4-Methylphenol	106-44-5	ug/L	71	2	0	543		0.1										
Anthracene	120-12-7	ug/L	2.8	1	1	0.012		**233**										
Benzaldehyde	100-52-7	ug/L	24	3	0	57	Reg 4	0.4										
Benzo(a)anthracene	56-55-3	ug/L	12	3	3	0.018		**667**							**5.1**	J		
Benzo(a)pyrene	50-32-8	ug/L	11	3	3	0.015		**733**							**4.3**	J		
Benzo(b)fluoranthene	205-99-2	ug/L	14	3	0	2.6	Reg 4	**5.4**							**4.5**	J		
Benzo(g,h,i)perylene	191-24-2	ug/L	9.8	3	0	0.44	Reg 4	**22**							**3.3**	J		
Benzo(k)fluoranthene	207-08-9	ug/L	11	3	0	0.64	Reg 4	**17**							**3.9**	J		
Bis(2-ethylhexyl)phthalate	117-81-7	ug/L	13	8	0	16		0.8			2.6	J			6.9	J	2.6	J
Caprolactam	105-60-2	ug/L	3.7	1	0	-		-										
Carbazole	86-74-8	ug/L	4.4	1	0	-		-										
Chrysene	218-01-9	ug/L	16	3	0	4.7	Reg 4	**3.4**							**6.3**	J		
Dibenzo(a,h)anthracene	53-70-3	ug/L	4.1	1	0	0.28	Reg 4	**15**										
Di-n-butylphthalate	84-74-2	ug/L	2.5	1	0	19		0.1										
Fluoranthene	206-44-0	ug/L	29	4	4	0.04		**725**							**12**	J		
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	9.3	3	0	0.28	Reg 4	**33**							**3.2**	J		
N-Nitrosodiphenylamine	86-30-6	ug/L	4.4	1	0	210		0.0									4.4	J
Phenanthrene	85-01-8	ug/L	17	3	3	0.4		**43**							**7.1**	J		
Pyrene	129-00-0	ug/L	22	4	4	0.025		**880**							**9.4**	J		

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-3
Semivolatile Organic Compounds (SVOCs) Detected in Pore Water (May 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

	LD116		LD118		LD123		LD126		LD129		LD132		LD136		LD136DUP	
	5/3/2013		5/3/2013		5/3/2013		5/2/2013		5/2/2013		5/2/2013		5/2/2013		5/2/2013	
Analyte	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,4-Dioxane	11	J	130	J	69	J	110	J	170	J	25	J				
2-Methylphenol													**17**	J	8	J
4-Methylphenol									9.3	J			71	J	2.9	J
Anthracene													**2.8**	J		
Benzaldehyde							5.8	J	7.6	J			24	J	5.5	J
Benzo(a)anthracene									**4.1**	J			**12**	J		
Benzo(a)pyrene									**4**	J			**11**	J		
Benzo(b)fluoranthene									**5.1**	J			**14**	J		
Benzo(g,h,i)perylene									**3.7**	J			**9.8**	J		
Benzo(k)fluoranthene									**3.7**	J			**11**	J		
Bis(2-ethylhexyl)phthalate	10	J					2.8	J	6.3	J	13	J	11	J	5.4	J
Caprolactam													3.7	J	3.5	J
Carbazole													4.4	J		
Chrysene									**6.3**	J			**16**	J	2.8	J
Dibenzo(a,h)anthracene													**4.1**	J		
Di-n-butylphthalate													2.5	J		
Fluoranthene							**3.3**	J	**12**	J			**29**	J	**5.3**	J
Indeno(1,2,3-cd)pyrene									**3.2**	J			**9.3**	J		
N-Nitrosodiphenylamine																
Phenanthrene									**6.5**	J			**17**	J	**2.5**	J
Pyrene							**2.6**	J	**8.8**	J			**22**	J	**3.8**	J

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-4
Pesticides Detected in Pore Water (May 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

			Summary Statistics[1]			Surface Water Screening Level[2]			LD103		LD106		LD108		LD110		LD114	
									5/2/2013		5/2/2013		5/2/2013		5/2/2013		5/3/2013	
Analyte	CAS #	Unit	Maximum Detection	Number of Detections	Number of Exceedances	Value	Source	Maximum EEQ[3]	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	ug/L	0.057	2	2	0.011		5.2							0.057	J		
4,4'-DDE	72-55-9	ug/L	0.037	4	0	0.41	Reg 4	0.1							0.037	J		
4,4'-DDT	50-29-3	ug/L	0.12	3	3	0.0005		240							0.12	J		
alpha-Chlordane	5103-71-9	ug/L	0.39	4	4	0.0022		177							0.029	J		
Dieldrin	60-57-1	ug/L	0.0082	1	0	0.056		0.1							0.0082	J		
Endosulfan II	33213-65-9	ug/L	0.01	1	0	0.051		0.2							0.01	J		
Endrin aldehyde	7421-93-4	ug/L	0.036	3	0	-		-							0.036	J		
Endrin ketone	53494-70-5	ug/L	0.017	1	0	-		-							0.017	J		
gamma-BHC (Lindane)	58-89-9	ug/L	0.021	1	1	0.01		2.1										
gamma-Chlordane	5103-74-2	ug/L	0.2	2	2	0.0022		91										
Heptachlor epoxide	1024-57-3	ug/L	0.022	2	2	0.0019		12										

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-4
Pesticides Detected in Pore Water (May 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

	LD116		LD118		LD123		LD126		LD129		LD132		LD136		LD136DUP	
	5/3/2013		5/3/2013		5/3/2013		5/2/2013		5/2/2013		5/2/2013		5/2/2013		5/2/2013	
Analyte	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
4,4'-DDD													**0.054**	J	**0.052**	J
4,4'-DDE					0.0019	J	0.013	J					0.031	J	0.05	J
4,4'-DDT							**0.016**	J					**0.039**	J	**0.064**	J
alpha-Chlordane							**0.063**	J	**0.0052**	J			**0.39**	J	**0.4**	J
Dieldrin																
Endosulfan II																
Endrin aldehyde							0.0025	J					0.031	J	0.011	J
Endrin ketone																
gamma-BHC (Lindane)					**0.021**	J										
gamma-Chlordane							**0.031**	J					**0.2**	J	**0.16**	J
Heptachlor epoxide							**0.0045**	J					**0.022**	J		

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-5
Polychlorinated Biphenyls (PCBs) Detected in Pore Water (May 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

Analyte	CAS #	Unit	Summary Statistics[1] Maximum Detection	Number of Detections	Number of Exceedances	BTAG Surface Water Screening Level[2]	Maximum EEQ[4]	LD126 5/2/2013 Result	Flag	LD129 5/2/2013 Result	Flag	LD132 5/2/2013 Result	Flag	LD132DUP 5/2/2013 Result	Flag	LD136 5/2/2013 Result	Flag
PCB-1	2051-60-7	pg/L	30700	4	NA	-	-	7490		5660		30700	J	19800	J	50.1	
PCB-10	33146-45-1	pg/L	3910	3	NA	-	-	561		285		3910		2020			
PCB-104	56558-16-8	pg/L	73	2	NA	-	-	73				69.3	J	83	J		
PCB-105	32598-14-4	pg/L	32100	4	NA	-	-	2980		146		32100	J	502	J	295	
PCB-107/124	70424-68-9/70424-70-3	pg/L	3210	3	NA	-	-			18.1	J	3210		52.8		37	J
PCB-109	74472-35-8	pg/L	3900	3	NA	-	-			20.5		3900				53.1	
PCB-11	2050-67-1	pg/L	1210	4	NA	-	-	1210		207		163		136		196	
PCB-110/115	38380-03-9/74472-38-1	pg/L	103000	3	NA	-	-			707		103000	J	2870		1440	
PCB-114	74472-37-0	pg/L	1610	3	NA	-	-			7.2	J	1610	J	17.2	J	13.6	J
PCB-118	31508-00-6	pg/L	80900	4	NA	-	-	9810		335		80900	J	1480	J	764	
PCB-12/13	2974-92-7/2974-90-5	pg/L	1220	3	NA	-	-	1220		94.9		256		151			
PCB-123	65510-44-3	pg/L	494	2	NA	-	-			9.6	J	494		116	J		
PCB-126	57465-28-8	pg/L	53.1	3	NA	-	-	45.2				53.1		6.5	J	8.6	J
PCB-128/166	38380-07-3/41411-63-6	pg/L	17700	4	NA	-	-	3070		153		17700		621		357	
PCB-129/138/160/163	55215-18-4/35065-28-2/41411-62-5/74472-44-9	pg/L	98400	4	NA	-	-	32500		1600		98400	J	7190		3480	
PCB-130	52663-66-8	pg/L	5350	3	NA	-	-			71.3		5350		270		138	
PCB-131	61798-70-7	pg/L	1410	1	NA	-	-					1410					
PCB-132	38380-05-1	pg/L	31300	3	NA	-	-			477		31300		2190		1030	
PCB-133	35694-04-3	pg/L	786	3	NA	-	-			19.8	J	786		104		31.6	
PCB-134/143	52704-70-8/68194-15-0	pg/L	4150	4	NA	-	-	908		59.7		4150		263		120	
PCB-135/151/154	52744-13-5/52663-63-5/60145-22-4	pg/L	18100	4	NA	-	-	18100		617		17500		3140		1130	
PCB-136	38411-22-2	pg/L	8020	2	NA	-	-			188		8020		1130			
PCB-137	35694-06-5	pg/L	5950	3	NA	-	-			165		5950				361	
PCB-139/140	56030-56-9/59291-64-4	pg/L	1710	1	NA	-	-					1710					
PCB-141	52712-04-6	pg/L	12800	4	NA	-	-	4390		352		12800		1500		745	
PCB-144	68194-14-9	pg/L	2430	3	NA	-	-			75.2		2430		409		134	
PCB-145	74472-40-5	pg/L	6070	1	NA	-	-	6070									
PCB-146	51908-16-8	pg/L	8560	3	NA	-	-			193		8560		967		380	
PCB-147/149	68194-13-8/38380-04-0	pg/L	54400	4	NA	-	-	34200		1430		54400	J	7380		2870	
PCB-148	74472-41-6	pg/L	275	1	NA	-	-	275									
PCB-15	2050-68-2	pg/L	3410	4	NA	-	-	3410		599		453	J	301	J	111	
PCB-150	68194-08-1	pg/L	104	1	NA	-	-					104		35.4			
PCB-152	68194-09-2	pg/L	84.9	1	NA	-	-					84.9		25.2			
PCB-153/168	35065-27-1/59291-65-5	pg/L	62000	4	NA	-	-	32100		1420		62000	J	6790		3100	
PCB-156/157	38380-08-4/69782-90-7	pg/L	12200	4	NA	-	-	2210		102		12200	J	457	J	228	
PCB-158	74472-42-7	pg/L	10500	4	NA	-	-	2290		126		10500		570		294	
PCB-159	39635-35-3	pg/L	271	3	NA	-	-	271				164		51.6		27.3	
PCB-16	38444-78-9	pg/L	286	1	NA	-	-							1700		286	
PCB-161	74472-43-8	pg/L	4370	1	NA	-	-	4370									
PCB-162	39635-34-2	pg/L	389	2	NA	-	-	204				389					

Table 6-5
Polychlorinated Biphenyls (PCBs) Detected in Pore Water (May 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

Analyte	CAS #	Unit	Summary Statistics[1] Maximum Detection	Number of Detections	Number of Exceedances	BTAG Surface Water Screening Level[2]	Maximum EEQ[4]	LD126 5/2/2013 Result	Flag	LD129 5/2/2013 Result	Flag	LD132 5/2/2013 Result	Flag	LD132DUP 5/2/2013 Result	Flag	LD136 5/2/2013 Result	Flag
PCB-164	74472-45-0	pg/L	6160	4	NA	-	-	5130		125		6160				280	
PCB-167	52663-72-6	pg/L	3710	4	NA	-	-	820		43.3		3710	J	155	J	87	
PCB-169	32774-16-6	pg/L	39.7	1	NA	-	-					39.7					
PCB-17	37680-66-3	pg/L	6700	4	NA	-	-	6700		1750		6420		3900		211	
PCB-170	35065-30-6	pg/L	10200	4	NA	-	-	10200		558		8720		1880		1120	
PCB-171/173	52663-71-5/68194-16-1	pg/L	2870	4	NA	-	-	2030		185		2870		658		352	
PCB-172	52663-74-8	pg/L	3930	4	NA	-	-	3930		100		1300		329		204	
PCB-174	38411-25-5	pg/L	12200	4	NA	-	-	12200		609		8330		2240		1350	
PCB-175	40186-70-7	pg/L	303	1	NA	-	-					303					
PCB-176	52663-65-7	pg/L	1270	4	NA	-	-	1270		71.1		756		279		145	
PCB-177	52663-70-4	pg/L	6830	4	NA	-	-	6830		384		4550		1330		671	
PCB-178	52663-67-9	pg/L	2080	4	NA	-	-	2080		120		1160		461		215	
PCB-179	52663-64-6	pg/L	5560	3	NA	-	-	5560		238				1010		464	
PCB-18/30	37680-65-2/35693-92-6	pg/L	10300	4	NA	-	-	10300		4780		9000		5310		478	
PCB-180/193	35065-29-3/69782-91-8	pg/L	25300	4	NA	-	-	25300		1270		16000		4670		2650	
PCB-183/185	52663-69-1/52712-05-7	pg/L	9690	4	NA	-	-	9690		351		5350		1380		785	
PCB-187	52663-68-0	pg/L	16900	4	NA	-	-	16900		767		8540		3180		1450	
PCB-189	39635-31-9	pg/L	380	4	NA	-	-	380		24		331	J	83.6	J	36.6	
PCB-19	38444-73-4	pg/L	21000	4	NA	-	-	5780		1260		21000	J	14000	J	79.3	
PCB-190	41411-64-7	pg/L	2140	4	NA	-	-	2140		121		1440		375		230	
PCB-191	74472-50-7	pg/L	531	4	NA	-	-	531		22.6		303		75.9		38	
PCB-194	35694-08-7	pg/L	7590	4	NA	-	-	7590		307		1870		817		562	
PCB-195	52663-78-2	pg/L	3300	4	NA	-	-	3300		131		892		385		236	
PCB-196	42740-50-1	pg/L	4940	4	NA	-	-	4940		175		1300		546		344	
PCB-197/200	33091-17-7/52663-73-7	pg/L	1130	4	NA	-	-	1130		44.8		364		101		76.4	
PCB-198/199	68194-17-2/52663-75-9	pg/L	7490	4	NA	-	-	7490		310		2270		957		623	
PCB-2	2051-61-8	pg/L	358	4	NA	-	-	358		232		251		135		12.5	J
PCB-20/28	38444-84-7/7012-37-5	pg/L	7630	4	NA	-	-	7630		1120		1670		1250		530	
PCB-201	40186-71-8	pg/L	871	3	NA	-	-	871				283		111		61.1	
PCB-202	2136-99-4	pg/L	1310	4	NA	-	-	1310		56		468	J	230	J	86.1	
PCB-203	52663-76-0	pg/L	5560	4	NA	-	-	5560		224		1630		723		434	
PCB-205	74472-53-0	pg/L	337	4	NA	-	-	337		20.2		81.5	J	39.3	J	33.7	
PCB-206	40186-72-9	pg/L	3120	4	NA	-	-	3120		147		1080	J	655	J	238	
PCB-207	52663-79-3	pg/L	347	3	NA	-	-	347				129		64.8		29	
PCB-208	52663-77-1	pg/L	830	4	NA	-	-	830		40.6		390	J	256	J	66.7	
PCB-209	2051-24-3	pg/L	2320	4	NA	-	-	2320		103		792	J	682	J	137	
PCB-21/33	55702-46-0/38444-86-9	pg/L	2440	4	NA	-	-	2440		846		463		381		228	
PCB-22	38444-85-8	pg/L	2280	4	NA	-	-	2280		495		511		385		200	
PCB-24	55702-45-9	pg/L	1950	4	NA	-	-	1950		1580		1230		33		18	J
PCB-25	55712-37-3	pg/L	2170	4	NA	-	-	2170		139		783		568		51.3	
PCB-26/29	38444-81-4/15862-07-4	pg/L	3180	4	NA	-	-	3180		290		898		627		85.6	
PCB-27	38444-76-7	pg/L	6790	4	NA	-	-	3700		391		6790		3860		53.3	

Table 6-5
Polychlorinated Biphenyls (PCBs) Detected in Pore Water (May 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

Analyte	CAS #	Unit	Summary Statistics[1]			BTAG Surface Water Screening Level[2]	Maximum EEQ[4]	LD126		LD129		LD132		LD132DUP		LD136	
			Maximum Detection	Number of Detections	Number of Exceedances			5/2/2013		5/2/2013		5/2/2013		5/2/2013		5/2/2013	
								Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-3	2051-62-9	pg/L	1390	4	NA	-	-	983		479		1390	J	863	J	19.2	J
PCB-31	16606-02-3	pg/L	5990	4	NA	-	-	5990		1010		1730		1120		367	
PCB-32	38444-77-8	pg/L	4290	4	NA	-	-	4290		678		2930		1820		120	
PCB-34	37680-68-5	pg/L	72.7	2	NA	-	-	72.7				44		29.6			
PCB-35	37680-69-6	pg/L	76	2	NA	-	-	76								21.9	
PCB-37	38444-90-5	pg/L	1570	4	NA	-	-	1570		206		192	J	205	J	149	
PCB-4	13029-08-8	pg/L	127000	4	NA	-	-	16300		10300		127000	J	78900	J	186	
PCB-40/41/71	38444-93-8/52663-59-9/41464-46-4	pg/L	3980	4	NA	-	-	3980		170		2580		1160		247	
PCB-42	36559-22-5	pg/L	2190	3	NA	-	-	2190		156				723		148	
PCB-43	70362-46-8	pg/L	46.1	2	NA	-	-					46.1				21.5	
PCB-44/47/65	41464-39-5/2437-79-8/33284-54-7	pg/L	15700	4	NA	-	-	11000		441		15700		3360		407	
PCB-45/51	70362-45-7/68194-04-7	pg/L	4660	4	NA	-	-	4660		183		4280		2890		93.9	
PCB-46	41464-47-5	pg/L	693	3	NA	-	-	693		66.5				388		29.3	
PCB-48	70362-47-9	pg/L	155	3	NA	-	-			71.8		155		107		32.1	
PCB-49/69	41464-40-8/60233-24-1	pg/L	10500	4	NA	-	-	10500		240		8770		2550		228	
PCB-50/53	62796-65-0/41464-41-9	pg/L	5230	4	NA	-	-	4360		125		5230		3320		72	
PCB-52	35693-99-3	pg/L	31100	4	NA	-	-	13100		383		31100		1950		406	
PCB-54	15968-05-5	pg/L	2070	3	NA	-	-	536		13.8	J	2070		1500	J		
PCB-55	74338-24-2	pg/L	5610	1	NA	-	-	5610									
PCB-56	41464-43-1	pg/L	3380	3	NA	-	-			175		3380		360		199	
PCB-58	41464-49-7	pg/L	1130	1	NA	-	-					1130					
PCB-59/62/75	74472-33-6/54230-22-7/32598-12-2	pg/L	905	4	NA	-	-	905		40.6		227		117		38.8	J
PCB-6	25569-80-6	pg/L	5570	4	NA	-	-	2750		1190		5570		3030		64.4	
PCB-60	33025-41-1	pg/L	2510	4	NA	-	-	2510		90.9		1070		153		102	
PCB-61/70/74/76	33284-53-6/32598-11-1/32690-93-0/70362-48-0	pg/L	38500	4	NA	-	-	12000		546		38500		1110		723	
PCB-64	52663-58-8	pg/L	3560	4	NA	-	-	2260		160		3560		426		185	
PCB-66	32598-10-0	pg/L	6280	3	NA	-	-			284		6280		809		378	
PCB-7	33284-50-3	pg/L	281	3	NA	-	-	249		86.8		281		175			
PCB-77	32598-13-3	pg/L	549	4	NA	-	-	549		34.8		158		66.2		52	
PCB-8	34883-43-7	pg/L	5960	4	NA	-	-	5960		4570		5760		3130		217	
PCB-80	33284-52-5	pg/L	262	1	NA	-	-					262					
PCB-81	70362-50-4	pg/L	369	1	NA	-	-					369					
PCB-82	52663-62-4	pg/L	8920	3	NA	-	-			48.8		8920		135		85.5	
PCB-83/99	60145-20-2/38380-01-7	pg/L	40500	4	NA	-	-	10300		245		40500	J	1630		410	
PCB-84	52663-60-2	pg/L	19300	4	NA	-	-	2430		132		19300		461		242	
PCB-85/116/117	65510-45-4/18259-05-7/68194-11-6	pg/L	29100	4	NA	-	-	29100		82.1		17300		288		191	

Table 6-5
Polychlorinated Biphenyls (PCBs) Detected in Pore Water (May 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

			Summary Statistics[1]					LD126		LD129		LD132		LD132DUP		LD136	
			Maximum Detection	Number of Detections	Number of Exceedances	BTAG Surface Water Screening Level[2]	Maximum EEQ[4]	5/2/2013		5/2/2013		5/2/2013		5/2/2013		5/2/2013	
Analyte	CAS #	Unit						Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-86/87/97/108/119/125	55312-69-1/38380-02-8/41464-51-1/70362-41-3/56558-17-9/74472-39-2	pg/L	61200	4	NA	-	-	10400		300		61200	J	1210		616	
PCB-88/91	55215-17-3/68194-05-8	pg/L	3080	4	NA	-	-	3080		67.4		2830		666		119	
PCB-9	34883-39-1	pg/L	393	3	NA	-	-	393		181		209		116			
PCB-90/101/113	68194-07-0/37680-73-2/68194-10-5	pg/L	83800	4	NA	-	-	22000		669		83800	J	3710		1400	
PCB-92	52663-61-3	pg/L	3840	3	NA	-	-	3840		123						204	
PCB-93/95/98/100/102	73575-56-1/38379-99-6/60233-25-2/39485-83-1/68194-06-9	pg/L	65900	4	NA	-	-	20900		642		65900	J	4580		1240	
PCB-96	73575-54-9	pg/L	389	2	NA	-	-	204				389		146			
Total DiCB	25512-42-9	pg/L	135000	4	NA	-	-	32100		17500		135000		77400		775	
Total HpCB	28655-71-2	pg/L	99000	4	NA	-	-	99000		4820		59900		17900		9700	
Total HxCB	26601-64-9	pg/L	366000	4	NA	-	-	147000		7210		366000		33200		14800	
Total MoCB	27323-18-8	pg/L	36100	4	NA	-	-	8830		6370		36100		19200		81.8	
Total NoCB	53742-07-7	pg/L	4300	4	NA	-	-	4300		188		1710		853		334	
Total OcCB	55722-26-4	pg/L	32500	4	NA	-	-	32500		1270		9150		3880		2460	
Total PCBs	1111-11-1	pg/L	1320000	4	4	74[3]	**17838**	**574000**		**58700**		**1320000**		**227000**		**41600**	
Total PeCB	25429-29-2	pg/L	526000	4	NA	-	-	115000		3550		526000		18000		7110	
Total TeCB	26914-33-0	pg/L	125000	4	NA	-	-	74800		3180		125000		21100		3350	
Total TEQ	2222-22-2	pg/L	10.6	4	NA	-	-	5.1		0.023		10.6		0.73		0.91	
Total TrCB	25323-68-6	pg/L	58100	4	NA	-	-	58100		14500		56300		34600		2880	

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III Biological Technical Assistance Group (BTAG) Fresh Water Screening Benchmarks (7/2006).
3 - Total PCB value.
4 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
Highlighted values indicate their exceedances of screening level.

Table 6-6
Semivolatile Organic Compounds (SVOCs) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

			Summary Statistics(1)			Surface Water Screening Level(2)			0301-00		0301-02		0301-02D		0302-00	
									9/9/2013		9/9/2013		9/9/2013		9/9/2013	
Analyte	CAS #	Unit	Maximum Detection	Number of Detections	Number of Exceedances	Value	Source	Maximum EEQ(3)	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,4-Dioxane	123-91-1	ug/L	180	21	0	-		-	0.59	J	8.9		9.6			
2-Methylnaphthalene	91-57-6	ug/L	0.24	14	0	4.7		0.1								
4-Methylphenol	106-44-5	ug/L	1.3	1	0	543		0.002								
Acenaphthene	83-32-9	ug/L	0.23	12	0	5.8		0.04								
Acenaphthylene	208-96-8	ug/L	0.12	8	0	13	Reg 4	0.01								
Anthracene	120-12-7	ug/L	2.5	11	11	0.012		**208**								
Benzaldehyde	100-52-7	ug/L	3	3	0	-		-								
Benzo(a)anthracene	56-55-3	ug/L	0.2	12	7	0.018		**11**								
Benzo(a)pyrene	50-32-8	ug/L	0.017	1	1	0.015		**1.1**								
Benzo(b)fluoranthene	205-99-2	ug/L	0.034	2	0	2.6	Reg 4	0.01								
Benzo(g,h,i)perylene	191-24-2	ug/L	0.0075	2	0	0.44	Reg 4	0.02								
Benzo(k)fluoranthene	207-08-9	ug/L	0.013	3	0	0.64	Reg 4	0.02								
Chrysene	218-01-9	ug/L	0.059	11	0	4.7	Reg 4	0.01								
Dibenzo(a,h)anthracene	53-70-3	ug/L	0.0095	1	0	0.28	Reg 4	0.03								
Fluoranthene	206-44-0	ug/L	0.12	9	6	0.04		**3.0**								
Fluorene	86-73-7	ug/L	0.6	5	0	3		0.2								
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	0.0079	4	0	0.28	Reg 4	0.03								
Naphthalene	91-20-3	ug/L	0.88	7	0	1.1		0.8								
Pentachlorophenol	87-86-5	ug/L	0.58	4	1	0.5		**1.2**								
Phenanthrene	85-01-8	ug/L	1.5	10	2	0.4		**3.8**								
Pyrene	129-00-0	ug/L	0.45	12	12	0.025		**18**								

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-6
Semivolatile Organic Compounds (SVOCs) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

	0302-02		0303-00		0303-02		1001-00		1001-02		1001-02D		1001-04		1002-00		1002-02		1002-04		1003-00	
	9/9/2013		9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/10/2013	
Analyte	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
1,4-Dioxane	7.8				4.5		0.54	J	11		5.2	J	51				2.1	J	37			
2-Methylnaphthalene									0.024	J			0.074	J					0.047	J		
4-Methylphenol																						
Acenaphthene									0.1				0.21	J	0.029	J	0.066	J	0.23			
Acenaphthylene									0.04	J							0.013	J				
Anthracene									**0.079**	J					**0.021**	J						
Benzaldehyde																						
Benzo(a)anthracene													**0.069**	J	0.0068	J	0.016	J				
Benzo(a)pyrene																						
Benzo(b)fluoranthene																						
Benzo(g,h,i)perylene																			0.0065	J		
Benzo(k)fluoranthene																						
Chrysene									0.032	J					0.0065	J			0.018	J		
Dibenzo(a,h)anthracene									0.0095	J												
Fluoranthene													**0.12**									
Fluorene													0.23	J					0.19			
Indeno(1,2,3-cd)pyrene									0.0079	J									0.0071	J		
Naphthalene																						
Pentachlorophenol																	0.2	R	0.056	J		
Phenanthrene																	0.045	J				
Pyrene									**0.071**	J			**0.23**		**0.061**	J	**0.044**	J				

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-6
Semivolatile Organic Compounds (SVOCs) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

	1003-02		1601-00		1601-02		1602-00		1602-02		1602-04		1603-00		1603-00DUP		1603-02		1603-04		1603-04DUP	
	9/10/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013	
Analyte	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
1,4-Dioxane					20						170						32		180		160	
2-Methylnaphthalene			0.0068	J	0.079	J					0.24						0.055	J				
4-Methylphenol																						
Acenaphthene			0.056	J					0.059	J									0.1	J	0.11	J
Acenaphthylene			0.0078	J							0.084	J					0.035	J				
Anthracene											**2.5**	J					**0.36**		**2.5**	J	**2.4**	J
Benzaldehyde																			3	J	2.1	J
Benzo(a)anthracene					**0.052**	J			**0.026**	J							**0.084**	J				
Benzo(a)pyrene																					**0.041**	J
Benzo(b)fluoranthene																						
Benzo(g,h,i)perylene			0.0075	J																	0.0096	J
Benzo(k)fluoranthene																						
Chrysene			0.015	J	0.025	J			0.019	J	0.059	J					0.029	J	0.033	J	0.022	J
Dibenzo(a,h)anthracene											**5**	R										
Fluoranthene					**0.078**	J	0.011	J	**0.086**	J			0.027	J			**0.12**				**0.46**	J
Fluorene											0.12	J							0.09	J		
Indeno(1,2,3-cd)pyrene																			0.0075	J		
Naphthalene											0.88						0.12		0.67			
Pentachlorophenol			0.2	R	0.2	R							0.2	R							0.2	R
Phenanthrene							0.0073	J					0.0081	J			0.022	J	**1.5**	J	**1.9**	
Pyrene			**0.084**	J	**0.095**	J			**0.11**		**0.45**		**0.056**	J	**0.029**	J	**0.14**					

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-6
Semivolatile Organic Compounds (SVOCs) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

	1802-00		1802-02		1803-00		2501-00		2501-02		2502-00		2502-02		2503-00		2503-02		3301-00		3301-02	
	9/13/2013		9/13/2013		9/13/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013		9/10/2013		9/10/2013	
Analyte	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
1,4-Dioxane							70		89		31		100		3.4		63					
2-Methylnaphthalene	0.0069	J	0.0081	J	0.01	J	0.062	J	0.048	J	0.058	J					0.065	J				
4-Methylphenol											1.3	J										
Acenaphthene									0.18		0.047	J			0.018	J	0.15					
Acenaphthylene											0.058	J			0.0087	J	0.12					
Anthracene			**0.021**	J			**0.45**		**0.55**		**0.16**		**0.7**				**1.8**	J				
Benzaldehyde									2.6	J			1.9	J								
Benzo(a)anthracene	0.012	J	0.017	J	0.01	J	**0.1**		**0.11**				**0.2**									
Benzo(a)pyrene													**0.017**	J								
Benzo(b)fluoranthene					0.017	J							0.034	J								
Benzo(g,h,i)perylene																						
Benzo(k)fluoranthene					0.0055	J	0.0061	J					0.013	J								
Chrysene			0.019	J	0.017	J																
Dibenzo(a,h)anthracene																						
Fluoranthene					0.03	J							**0.1**				**0.11**					
Fluorene									0.6													
Indeno(1,2,3-cd)pyrene							0.0052	J														
Naphthalene	0.023	J	0.028	J	0.015	J	0.11															
Pentachlorophenol	0.11	J									0.042	J	**0.58**	J								
Phenanthrene	0.018	J					0.04	J	0.081	J			**1.2**	J			0.31					
Pyrene											**0.073**	J					**0.15**					

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-6
Semivolatile Organic Compounds (SVOCs) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

	3302-00		3302-02		3302-04		3303-00		3303-02	
	9/10/2013		9/10/2013		9/10/2013		9/10/2013		9/10/2013	
Analyte	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
1,4-Dioxane					0.15	J			0.23	J
2-Methylnaphthalene										
4-Methylphenol										
Acenaphthene										
Acenaphthylene										
Anthracene										
Benzaldehyde										
Benzo(a)anthracene										
Benzo(a)pyrene										
Benzo(b)fluoranthene										
Benzo(g,h,i)perylene										
Benzo(k)fluoranthene										
Chrysene										
Dibenzo(a,h)anthracene										
Fluoranthene										
Fluorene										
Indeno(1,2,3-cd)pyrene										
Naphthalene										
Pentachlorophenol										
Phenanthrene										
Pyrene										

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-7
Polycyclic Aromatic Hydrocarbons (PAHs-SIM) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

			Summary Statistics[1]			Surface Water Screening Level[2]			0301-00		0301-02		0301-02D		0302-00	
									9/9/2013		9/9/2013		9/9/2013		9/9/2013	
Analyte	CAS #	Unit	Maximum Detection	Number of Detections	Number of Exceedances	Value	Source	Maximum EEQ[3]	Result	Flag	Result	Flag	Result	Flag	Result	Flag
2-Methylnaphthalene	91-57-6	ug/L	0.035	14	0	4.7		0.01	0.017	J	0.01	J	0.012	J	0.012	J
Acenaphthene	83-32-9	ug/L	0.48	14	0	5.8		0.08	0.033	J	0.094	J	0.1		0.028	J
Acenaphthylene	208-96-8	ug/L	0.021	10	0	13	Reg 4	0.002	0.012	J	0.021	J	0.024	J		
Anthracene	120-12-7	ug/L	0.15	12	11	0.012		**12.5**	**0.077**	J	**0.098**		**0.11**		0.011	J
Benzo(a)anthracene	56-55-3	ug/L	0.09	10	6	0.018		**5.0**			**0.038**	J				
Benzo(a)pyrene	50-32-8	ug/L	0.052	5	5	0.015		**3.5**								
Benzo(b)fluoranthene	205-99-2	ug/L	0.073	7	0	2.6	Reg 4	0.03								
Benzo(g,h,i)perylene	191-24-2	ug/L	0.032	6	0	0.44	Reg 4	0.07								
Benzo(k)fluoranthene	207-08-9	ug/L	0.024	6	0	0.64	Reg 4	0.04								
Chrysene	218-01-9	ug/L	0.076	10	0	4.7	Reg 4	0.02			0.043	J				
Dibenzo(a,h)anthracene	53-70-3	ug/L	0.0072	3	0	0.28	Reg 4	0.03								
Fluoranthene	206-44-0	ug/L	0.17	16	9	0.04		**4.3**	0.037	J	**0.052**	J	**0.04**	J	0.03	J
Fluorene	86-73-7	ug/L	0.071	5	0	3		0.02	0.035	J						
Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	0.031	6	0	0.28	Reg 4	0.11								
Naphthalene	91-20-3	ug/L	0.094	16	0	1.1		0.09	0.046	J	0.015	J	0.016	J	0.044	J
Pentachlorophenol	87-86-5	ug/L	0.13	4	0	0.5		0.26	0.11	J	0.2	R	0.2	R	0.041	J
Phenanthrene	85-01-8	ug/L	0.23	16	0	0.4		0.58	0.045	J	0.073	J	0.098		0.032	J
Pyrene	129-00-0	ug/L	0.21	16	15	0.025		**8.4**	**0.032**	J	**0.098**		**0.092**	J	**0.053**	J

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-7
Polycyclic Aromatic Hydrocarbons (PAHs-SIM) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

	0302-02		0303-00		0303-02		1001-00		1001-02D		1003-00		1003-02		3301-00		3301-02		3302-00	
	9/9/2013		9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/10/2013		9/10/2013		9/10/2013		9/10/2013		9/10/2013	
Analyte	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
2-Methylnaphthalene	0.035	J	0.0056	J	0.018	J	0.017	J	0.014	J			0.013	J			0.0072	J	0.0085	J
Acenaphthene	0.11		0.01	J	0.11		0.031	J	0.088	J			0.062	J			0.022	J	0.026	J
Acenaphthylene	0.018	J			0.011	J			0.028	J			0.0075	J					0.0051	J
Anthracene	**0.15**				**0.091**	J	**0.018**	J	**0.07**	J			**0.036**	J			**0.023**	J		
Benzo(a)anthracene	**0.09**	J	**0.018**	J	**0.086**	J							**0.04**	J			0.013	J	0.0055	J
Benzo(a)pyrene	**0.035**	J			**0.052**	J							**0.031**	J						
Benzo(b)fluoranthene	0.054	J	0.028	J	0.073	J							0.054	J			0.0095	J		
Benzo(g,h,i)perylene	0.018	J	0.013	J	0.032	J							0.023	J						
Benzo(k)fluoranthene	0.021	J	0.011	J	0.024	J							0.021	J						
Chrysene	0.076	J	0.019	J	0.067	J							0.034	J			0.011	J	0.0057	J
Dibenzo(a,h)anthracene					0.0072	J														
Fluoranthene	**0.16**		**0.047**	J	**0.17**		0.027	J	**0.044**	J	0.021	J	**0.12**		0.021	J	**0.061**	J	0.029	J
Fluorene	0.071	J			0.043	J	0.024	J	0.041	J			0.06	J						
Indeno(1,2,3-cd)pyrene	0.019	J	0.011	J	0.031	J							0.022	J						
Naphthalene	0.094	J	0.022	J	0.065	J	0.034	J	0.017	J	0.022	J	0.058	J	0.018	J	0.028	J	0.036	J
Pentachlorophenol	0.2	R	0.2	R	0.2	R	0.064	J	0.2	R	0.2	R	0.13	J	0.2	R	0.2	R	0.2	R
Phenanthrene	0.23		0.018	J	0.18		0.033	J	0.1		0.019	J	0.073	J	0.014	J	0.047	J	0.028	J
Pyrene	**0.21**		**0.043**	J	**0.21**		**0.045**	J	**0.034**	J	**0.051**	J	**0.12**		**0.049**	J	**0.076**	J	0.024	J

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-7
Polycyclic Aromatic Hydrocarbons (PAHs-SIM) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

	3302-02		3302-04		3303-00		3303-02	
	9/10/2013		9/10/2013		9/10/2013		9/10/2013	
Analyte	Result	Flag	Result	Flag	Result	Flag	Result	Flag
2-Methylnaphthalene	0.0052	J	0.016	J	0.0069	J	0.006	J
Acenaphthene	0.13		0.24		0.028	J	0.48	
Acenaphthylene	0.01	J	0.016	J	0.0058	J	0.012	J
Anthracene	**0.028**	J	**0.041**	J	**0.02**	J	**0.064**	J
Benzo(a)anthracene	**0.07**	J	**0.08**	J			0.0081	J
Benzo(a)pyrene	**0.04**	J	**0.045**	J				
Benzo(b)fluoranthene	0.055	J	0.066	J				
Benzo(g,h,i)perylene	0.019	J	0.026	J				
Benzo(k)fluoranthene	0.021	J	0.019	J				
Chrysene	0.056	J	0.063	J			0.0059	J
Dibenzo(a,h)anthracene	0.0063	J	0.007	J				
Fluoranthene	**0.11**		**0.12**		0.035	J	**0.055**	J
Fluorene								
Indeno(1,2,3-cd)pyrene	0.019	J	0.026	J				
Naphthalene	0.02	J	0.032	J	0.014	J	0.016	J
Pentachlorophenol	0.2	R	0.2	R	0.2	R	0.2	R
Phenanthrene	0.034	J	0.089	J	0.015	J	0.09	J
Pyrene	**0.16**		**0.18**		**0.03**	J	**0.093**	J

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-8
Pesticides Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

Analyte	CAS #	Unit	Summary Statistics[1]			Surface Water Screening Level[2]		Maximum EEQ[4]	0301-00 9/9/2013		0301-02 9/9/2013		0301-02DUP 9/9/2013		0302-00 9/9/2013	
			Maximum Detection	Number of Detections	Number of Exceedances	Value	Source		Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD	72-54-8	ug/L	0.0028	1	0	0.011		0.3								
4,4'-DDE	72-55-9	ug/L	0.0034	7	0	0.41	Reg 4	0.01								
4,4'-DDT	50-29-3	ug/L	0.018	31	31	0.0005		**36**							**0.011**	
Aldrin	309-00-2	ug/L	0.0042	4	0	3		0.001								
alpha-BHC	319-84-6	ug/L	0.0028	7	0	0.01	(3)	0.3								
alpha-Chlordane	5103-71-9	ug/L	0.0035	18	14	0.0022		**1.6**							0.0019	J
beta-BHC	319-85-7	ug/L	0.011	9	1	0.01	(3)	**1.1**								
delta-BHC	319-86-8	ug/L	0.0066	9	0	141		0.00005	0.001	J						
Dieldrin	60-57-1	ug/L	0.02	36	0	0.056		0.4	0.0099		0.0057	J	0.0052	J	0.012	
Endosulfan I	959-98-8	ug/L	0.0043	11	0	0.051		0.1	0.001	J	0.001	J				
Endosulfan II	33213-65-9	ug/L	0.0048	25	0	0.051		0.1	0.0045	J					0.0037	J
Endrin	72-20-8	ug/L	0.003	6	0	0.036		0.1								
Endrin aldehyde	7421-93-4	ug/L	0.0049	15	0	-		-	0.0013	J						
Endrin ketone	53494-70-5	ug/L	0.0029	8	0	-		-								
gamma-BHC (Lindane)	58-89-9	ug/L	0.0026	4	0	0.01		0.3								
gamma-Chlordane	5103-74-2	ug/L	0.007	19	10	0.0022		**3.2**							0.0015	J
Heptachlor	76-44-8	ug/L	0.0063	10	5	0.0019		**3.3**	0.001	J						
Heptachlor epoxide	1024-57-3	ug/L	0.0026	11	9	0.0019		**1.4**							**0.0022**	J
Methoxychlor	72-43-5	ug/L	0.0082	4	0	0.019		0.4								

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Used gamma-BHC benchmark as a surrogate.
4 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-8
Pesticides Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

	0302-02		0303-00		0303-02		1001-00		1001-02		1001-02DUP		1001-04		1002-00		1002-02		1002-04		1003-00	
	9/9/2013		9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/10/2013	
Analyte	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
4,4'-DDD																						
4,4'-DDE													0.0034	J					0.0012	J		
4,4'-DDT	**0.0026**	J	**0.0089**	J	**0.0022**	J	**0.0092**	J					**0.002**	J	**0.013**	J					**0.01**	
Aldrin													0.0013	J					0.0021	J		
alpha-BHC													0.0016	J								
alpha-Chlordane							**0.0023**	J	**0.0022**	J					**0.0023**	J	0.0019	J			0.0021	J
beta-BHC									0.0039	J			0.0023	J					0.0035	J	0.0027	
delta-BHC									0.005	J	0.0053		0.0066	J					0.0042	J		
Dieldrin	0.0094		0.0096		0.0047		0.013		0.0074	J	0.0079	J	0.0042	J	0.016		0.0097		0.0058	J	0.014	
Endosulfan I													0.0017	J					0.0021	J		
Endosulfan II			0.0024	J	0.0031	J	0.0024	J					0.0026	J	0.0036	J					0.0048	J
Endrin																			0.0021	J		
Endrin aldehyde					0.0024	J							0.0031	J			0.0019	J	0.0022	J		
Endrin ketone																						
gamma-BHC (Lindane)													0.0015	J					0.0015	J		
gamma-Chlordane	0.0016	J					0.0013	J							0.0013	J			0.0018	J	0.0012	J
Heptachlor																						
Heptachlor epoxide															**0.0021**						**0.0021**	J
Methoxychlor																						

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Used gamma-BHC benchmark as a surrogate.
4 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-8
Pesticides Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

	1003-02		1601-00		1601-02		1602-00		1602-02		1602-04		1603-00		1603-00DUP		1603-02		1603-04		1603-04DUP	
	9/10/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013	
Analyte	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
4,4'-DDD					0.0028	J																
4,4'-DDE											0.0013	J	0.0011	J					0.0022	J		
4,4'-DDT	**0.011**		**0.015**	J	**0.0053**	J	**0.0097**	J	**0.003**	J	**0.0041**	J	**0.0067**	J	**0.0021**	J	**0.0073**	J	**0.018**	J	**0.012**	J
Aldrin																						
alpha-BHC					0.0015						0.0019	J										
alpha-Chlordane	0.002	J	**0.0035**	J			**0.0024**	J	**0.0022**	J	**0.0027**	J			**0.0022**	J					0.0019	J
beta-BHC					0.0031	J					0.0026	J							0.0043	J		
delta-BHC																						
Dieldrin	0.011		0.02		0.0034	J	0.017		0.0073				0.011		0.012		0.0052					
Endosulfan I			0.0013	J							0.0025	J							0.0011	J	0.0011	J
Endosulfan II			0.0047	J	0.0019	J	0.0027	J	0.0034	J			0.0022	J	0.0022	J						
Endrin											0.0014	J										
Endrin aldehyde											0.0049	J	0.0018	J	0.0012	J	0.0014	J	0.0022	J		
Endrin ketone			0.0017	J			0.0028	J					0.0017	J	0.0021	J						
gamma-BHC (Lindane)											0.0015	J										
gamma-Chlordane	0.0014	J	**0.0025**	J	**0.0041**	J			0.0019	J	**0.0023**	J							**0.007**	J		
Heptachlor			0.0011	J	**0.0036**						**0.0039**						0.0015		**0.0063**	J	**0.004**	J
Heptachlor epoxide							**0.0026**	J							0.0018	J						
Methoxychlor					0.0061	J					0.0055	J										

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Used gamma-BHC benchmark as a surrogate.
4 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-8
Pesticides Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

	1802-00		1802-02		1803-00		2501-00		2501-02		2502-00		2502-02		2503-00		2503-02		3301-00		3301-02	
	9/13/2013		9/13/2013		9/13/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013		9/12/2013		9/10/2013		9/10/2013	
Analyte	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
4,4'-DDD																						
4,4'-DDE									0.0013	J							0.0022	J				
4,4'-DDT	**0.0021**	J	**0.0016**	J	**0.0047**	J	**0.012**	J	**0.0051**	J	**0.013**	J	**0.0043**	J	**0.0084**	J	**0.0076**		**0.01**		**0.0014**	J
Aldrin									0.0031	J							0.0042	J				
alpha-BHC							0.0012	J	0.0028	J			0.0013	J			0.0011	J				
alpha-Chlordane	**0.0027**	J	0.0016	J	**0.0024**	J					0.0019	J			0.0018	J			0.002	J		
beta-BHC									0.0025	J			**0.011**	J								
delta-BHC							0.0016	J	0.0018	J	0.001	J	0.0035	J			0.0019	J				
Dieldrin	0.014	J	0.0066		0.017	J	0.012	J	0.013	J	0.015		0.016		0.012		0.012		0.014		0.008	
Endosulfan I							0.0022	J	0.0043	J			0.0038	J			0.0025	J				
Endosulfan II	0.0031	J	0.0019	J	0.0022	J	0.0028	J	0.0024	J	0.0036	J	0.0027	J	0.0026	J	0.0026	J	0.0043	J		
Endrin							0.0017	J					0.0018	J								
Endrin aldehyde					0.0012	J			0.0032	J	0.0015	J	0.0025	J			0.0023	J				
Endrin ketone	0.0019	J	0.0016	J	0.0029	J	0.0018	J							0.0016	J						
gamma-BHC (Lindane)																	0.0026	J				
gamma-Chlordane	0.0021	J					**0.0028**	J	**0.0028**	J			**0.0055**	J	0.0011	J	**0.0068**					
Heptachlor									**0.0019**	J			**0.0032**	J			**0.0027**	J				
Heptachlor epoxide	**0.0021**				**0.0023**		0.0018	J			**0.0021**	J			**0.0019**	J	**0.0026**	J	**0.002**	J		
Methoxychlor							0.0055	J	0.0082	J												

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Used gamma-BHC benchmark as a surrogate.
4 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-8
Pesticides Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

	3302-00		**3302-02**		**3302-04**		**3303-00**		**3303-02**	
	9/10/2013		**9/10/2013**		**9/10/2013**		**9/10/2013**		**9/10/2013**	
Analyte	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
4,4'-DDD										
4,4'-DDE										
4,4'-DDT	**0.0072**	J			**0.0016**	J	**0.0083**	J		
Aldrin										
alpha-BHC										
alpha-Chlordane			**0.0026**	J						
beta-BHC										
delta-BHC										
Dieldrin	0.012	J	0.0094		0.0023	J	0.012		0.0045	
Endosulfan I										
Endosulfan II	0.0025	J					0.0032	J		
Endrin	0.0016	J					0.003	J		
Endrin aldehyde							0.0027	J		
Endrin ketone										
gamma-BHC (Lindane)										
gamma-Chlordane			0.0021	J						
Heptachlor					0.0012					
Heptachlor epoxide										
Methoxychlor										

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III BTAG Fresh Water Screening Benchmarks (7/2006) unless otherwise noted.
3 - Used gamma-BHC benchmark as a surrogate.
4 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
BTAG = Biological Technical Assistance Group
Reg 4 = Region 4 Surface Water Screening Values (11/2015)
Highlighted values indicate their exceedances of screening level.

Table 6-9
Polychlorinated Biphenyls (PCBs) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

			Summary Statistics[1]			BTAG Surface		0301-00		0301-02		1001-00		1001-04		1601-00		1601-02	
			Maximum	Number of	Number of	Water Screening	Maximum	9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013	
Analyte	CAS #	Unit	Detection	Detections	Exceedances	Level[2]	EEQ[4]	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-1	2051-60-7	pg/L	30700	11	NA	-	-	48.7		177		70.3		1140		205		558	
PCB-10	33146-45-1	pg/L	3910	9	NA	-	-			23.4		12.5	J	57.1		21.1		42	
PCB-103	60145-21-3	pg/L	214	4	NA	-	-			4.8	J			9.8	J			12.4	J
PCB-104	56558-16-8	pg/L	83	3	NA	-	-												
PCB-105	32598-14-4	pg/L	32100	11	NA	-	-	12.3	J	15.7	J	21.2		94.5		26.6		61.3	
PCB-107/124	70424-68-9/70424-70-3	pg/L	3210	4	NA	-	-												
PCB-109	74472-35-8	pg/L	3900	3	NA	-	-												
PCB-11	2050-67-1	pg/L	1210	11	NA	-	-	76		68.6		70.7		100		70.4		82	
PCB-110/115	38380-03-9/74472-38-1	pg/L	103000	10	NA	-	-	80.8		112		125		496		141		326	
PCB-114	74472-37-0	pg/L	1610	5	NA	-	-							3.7	J				
PCB-118	31508-00-6	pg/L	80900	11	NA	-	-	32.3		42.9		56		247		61.9		164	
PCB-12/13	2974-92-7/2974-90-5	pg/L	1220	7	NA	-	-			45.5				140				47.9	
PCB-123	65510-44-3	pg/L	494	4	NA	-	-									1.1	J		
PCB-126	57465-28-8	pg/L	53.1	4	NA	-	-												
PCB-128/166	38380-07-3/41411-63-6	pg/L	17700	11	NA	-	-	9.1	J	12.4	J	16.6	J	90.1		22.3	J	36.9	J
PCB-129/138/160/163	55215-18-4/35065-28-2/41411-62-5/74472-44-9	pg/L	98400	11	NA	-	-	83.3		109		164		729		193		291	
PCB-130	52663-66-8	pg/L	5350	9	NA	-	-			6	J	6.9	J	40.8		8	J	18.2	J
PCB-131	61798-70-7	pg/L	1410	1	NA	-	-												
PCB-132	38380-05-1	pg/L	31300	9	NA	-	-	34.6		37.7		52.5				61.5		113	
PCB-133	35694-04-3	pg/L	786	4	NA	-	-												
PCB-134/143	52704-70-8/68194-15-0	pg/L	4150	7	NA	-	-							18.3	J	8.7	J		
PCB-135/151/154	52744-13-5/52663-63-5/60145-22-4	pg/L	18100	11	NA	-	-	45.2	J	87.4		106		422		126		201	
PCB-136	38411-22-2	pg/L	8020	8	NA	-	-	17.2	J			29.7		90.4		35.3		61.1	
PCB-137	35694-06-5	pg/L	5950	3	NA	-	-												
PCB-139/140	56030-56-9/59291-64-4	pg/L	1710	1	NA	-	-												
PCB-141	52712-04-6	pg/L	12800	11	NA	-	-	21.7		23.4		32.9		128		42.4		49.8	
PCB-144	68194-14-9	pg/L	2430	5	NA	-	-			8.3	J								
PCB-145	74472-40-5	pg/L	6070	1	NA	-	-												
PCB-146	51908-16-8	pg/L	8560	10	NA	-	-	16.5	J	16.2	J	23.4		99.6		27.9		51.1	
PCB-147/149	68194-13-8/38380-04-0	pg/L	54400	10	NA	-	-	79.2				193		2520		210		767	
PCB-148	74472-41-6	pg/L	275	1	NA	-	-												
PCB-15	2050-68-2	pg/L	3410	11	NA	-	-	51.1		67.7		55.3		195		60.3		140	
PCB-150	68194-08-1	pg/L	104	2	NA	-	-												
PCB-152	68194-09-2	pg/L	84.9	2	NA	-	-												
PCB-153/168	35065-27-1/59291-65-5	pg/L	62000	11	NA	-	-	84.3		107		148		668		173		265	
PCB-155	33979-03-2	pg/L	6.2	1	NA	-	-												
PCB-156/157	38380-08-4/69782-90-7	pg/L	12200	6	NA	-	-							58.4					
PCB-158	74472-42-7	pg/L	10500	11	NA	-	-	6.7	J	9.6	J	13.5	J	67.1		16.2	J	26.8	
PCB-159	39635-35-3	pg/L	271	6	NA	-	-							6.9	J	2.1	J		
PCB-16	38444-78-9	pg/L	1700	8	NA	-	-	85		179		81.3		365		63.7		595	
PCB-161	74472-43-8	pg/L	4370	1	NA	-	-												
PCB-162	39635-34-2	pg/L	389	2	NA	-	-												
PCB-164	74472-45-0	pg/L	6160	9	NA	-	-	6.4	J	7.4	J	10.3	J	57.6		16.4	J		
PCB-167	52663-72-6	pg/L	3710	10	NA	-	-	4.1	J	3.2	J			21.3		5.2	J	8.3	J
PCB-169	32774-16-6	pg/L	39.7	1	NA	-	-												

Table 6-9
Polychlorinated Biphenyls (PCBs) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

			Summary Statistics[1]			BTAG Surface		0301-00		0301-02		1001-00		1001-04		1601-00		1601-02	
			Maximum	Number of	Number of	Water Screening	Maximum	9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013	
Analyte	CAS #	Unit	Detection	Detections	Exceedances	Level[2]	EEQ[4]	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-17	37680-66-3	pg/L	6700	11	NA	-	-	71.8		221		109		597		76.3		583	
PCB-170	35065-30-6	pg/L	10200	11	NA	-	-	16.2	J	29.3		34.3		212		45.6		63.6	
PCB-171/173	52663-71-5/68194-16-1	pg/L	2870	9	NA	-	-					14.6	J	69.2		18.1	J	18.5	J
PCB-172	52663-74-8	pg/L	3930	8	NA	-	-							37.7		9.5	J	11.1	J
PCB-174	38411-25-5	pg/L	12200	10	NA	-	-	17.1	J	26.9		36.5		239		56.6			
PCB-175	40186-70-7	pg/L	303	1	NA	-	-												
PCB-176	52663-65-7	pg/L	1270	8	NA	-	-			4.7	J			28.8				8.8	J
PCB-177	52663-70-4	pg/L	6830	10	NA	-	-	13.3	J	17.4	J	21.9		138		29.1			
PCB-178	52663-67-9	pg/L	2080	8	NA	-	-							55.1		7.7	J	16.5	J
PCB-179	52663-64-6	pg/L	5560	7	NA	-	-							104		24.9		31.5	
PCB-18/30	37680-65-2/35693-92-6	pg/L	10300	11	NA	-	-	153		437		203		967		159		1220	
PCB-180/193	35065-29-3/69782-91-8	pg/L	25300	11	NA	-	-	41.5		74.6		88.8		487		125		168	
PCB-183/185	52663-69-1/52712-05-7	pg/L	9690	10	NA	-	-	15.4	J	23.9	J	30.2	J	154		37.4	J		
PCB-187	52663-68-0	pg/L	16900	11	NA	-	-	25.9		43.5		50.6		182		68.2		94.2	
PCB-189	39635-31-9	pg/L	380	6	NA	-	-									2.3	J		
PCB-19	38444-73-4	pg/L	21000	11	NA	-	-	93.2		214		76.8		430		110		399	
PCB-190	41411-64-7	pg/L	2140	11	NA	-	-	3.8	J	6.4	J	8	J	34.1		10.5	J	11.9	J
PCB-191	74472-50-7	pg/L	531	6	NA	-	-							9.1	J				
PCB-194	35694-08-7	pg/L	7590	11	NA	-	-	9.9	J	12.5	J	12.9	J	106		27.3		41.9	
PCB-195	52663-78-2	pg/L	3300	10	NA	-	-	3.8	J			7.1	J	49.1		11.3	J	14.8	J
PCB-196	42740-50-1	pg/L	4940	10	NA	-	-			10.1	J	8.9	J	78.6		18.1	J	38.3	
PCB-197/200	33091-17-7/52663-73-7	pg/L	1130	5	NA	-	-												
PCB-198/199	68194-17-2/52663-75-9	pg/L	7490	10	NA	-	-			21.5	J	13.5	J	107		31.1	J	45.8	
PCB-2	2051-61-8	pg/L	358	10	NA	-	-			7.3	J	4.7	J	63		4.7	J	23.6	
PCB-20/28	38444-84-7/7012-37-5	pg/L	7630	11	NA	-	-	136		282		213		1420		181		793	
PCB-201	40186-71-8	pg/L	871	5	NA	-	-							12.4	J				
PCB-202	2136-99-4	pg/L	1310	5	NA	-	-												
PCB-203	52663-76-0	pg/L	5560	11	NA	-	-	6.2	J	14.8	J	12.6	J	68.3		19	J	31.7	
PCB-205	74472-53-0	pg/L	337	6	NA	-	-							6.6	J				
PCB-206	40186-72-9	pg/L	3120	8	NA	-	-							49.8		12.3	J	28.5	
PCB-207	52663-79-3	pg/L	347	6	NA	-	-							4.3	J			2.8	J
PCB-208	52663-77-1	pg/L	830	6	NA	-	-											6.4	J
PCB-209	2051-24-3	pg/L	2320	8	NA	-	-	2.3	J					21.3				12.4	J
PCB-21/33	55702-46-0/38444-86-9	pg/L	2440	11	NA	-	-	47.9		75.3		93.7		157		55.4		304	
PCB-22	38444-85-8	pg/L	2280	11	NA	-	-	52.3		82.7		95.1		296		57.6		265	
PCB-24	55702-45-9	pg/L	1950	6	NA	-	-	46.5											
PCB-25	55712-37-3	pg/L	2170	11	NA	-	-	26.1		110		43.5		521		28		280	
PCB-26/29	38444-81-4/15862-07-4	pg/L	3180	11	NA	-	-	32	J	124		58.2		553		35.7	J	319	
PCB-27	38444-76-7	pg/L	6790	11	NA	-	-	24.3		85.7		33.8		88.3		46.9		283	
PCB-3	2051-62-9	pg/L	1390	10	NA	-	-			20.1		10.9	J	97.8		18.3	J	98.1	
PCB-31	16606-02-3	pg/L	5990	11	NA	-	-	115		243		243		999		130		700	
PCB-32	38444-77-8	pg/L	4290	11	NA	-	-	76		216		117		734		98.3		479	
PCB-34	37680-68-5	pg/L	72.7	3	NA	-	-												
PCB-35	37680-69-6	pg/L	76	2	NA	-	-												
PCB-37	38444-90-5	pg/L	1570	11	NA	-	-	25.8		28.7		41.1		97.8		30.7		87.9	
PCB-4	13029-08-8	pg/L	127000	11	NA	-	-	188		581		198		1810		440		848	

Table 6-9
Polychlorinated Biphenyls (PCBs) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

			Summary Statistics[1]			BTAG Surface		0301-00		0301-02		1001-00		1001-04		1601-00		1601-02	
			Maximum	Number of	Number of	Water Screening	Maximum	9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013	
Analyte	CAS #	Unit	Detection	Detections	Exceedances	Level[2]	EEQ[4]	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
PCB-40/41/71	38444-93-8/52663-59-9/41464-46-4	pg/L	3980	11	NA	-	-	64.7		133		77.6		427		76		500	
PCB-42	36559-22-5	pg/L	2190	10	NA	-	-	24.1		75.9		53.1		172		51.4		230	
PCB-43	70362-46-8	pg/L	46.1	2	NA	-	-												
PCB-44/47/65	41464-39-5/2437-79-8/33284-54-7	pg/L	15700	11	NA	-	-	98.7		301		141		815		160		832	
PCB-45/51	70362-45-7/68194-04-7	pg/L	4660	11	NA	-	-	62.6		210		62.9		499		77.7		462	
PCB-46	41464-47-5	pg/L	693	9	NA	-	-	13	J	53.1				137		26.1		136	
PCB-48	70362-47-9	pg/L	155	10	NA	-	-	11.6	J	22.6		21.1		51.1		17.2	J	75.1	
PCB-49/69	41464-40-8/60233-24-1	pg/L	10500	11	NA	-	-	79.5		223		104		748		103		606	
PCB-50/53	62796-65-0/41464-41-9	pg/L	5230	11	NA	-	-	55		198		54		496		70.9		487	
PCB-52	35693-99-3	pg/L	31100	11	NA	-	-	124		295		165		795		221		855	
PCB-54	15968-05-5	pg/L	2070	7	NA	-	-			31				51.2				74.2	
PCB-55	74338-24-2	pg/L	5610	1	NA	-	-												
PCB-56	41464-43-1	pg/L	3380	9	NA	-	-	24.2		30		37.7		112		35.3			
PCB-57	70424-67-8	pg/L	77.4	1	NA	-	-												
PCB-58	41464-49-7	pg/L	1130	1	NA	-	-												
PCB-59/62/75	74472-33-6/54230-22-7/32598-12-2	pg/L	905	11	NA	-	-	12	J	16.9	J	12.3	J	72.3		14.8	J	31.4	J
PCB-6	25569-80-6	pg/L	5570	11	NA	-	-	37.8		196		60.7		1020		48.1		365	
PCB-60	33025-41-1	pg/L	2510	10	NA	-	-	6.8	J	8.6	J	16.3	J	42.3		14.8	J		
PCB-61/70/74/76	33284-53-6/32598-11-1/32690-93-0/70362-48-0	pg/L	38500	11	NA	-	-	78.4	J	104		128		361		108		443	
PCB-64	52663-58-8	pg/L	3560	11	NA	-	-	37.7		61.3		64		165		61.8		194	
PCB-66	32598-10-0	pg/L	6280	10	NA	-	-	36.8		58		59.9		228		55.7		223	
PCB-68	73575-52-7	pg/L	94	1	NA	-	-												
PCB-7	33284-50-3	pg/L	281	6	NA	-	-							56.2				35.6	
PCB-72	41464-42-0	pg/L	65.4	1	NA	-	-												
PCB-77	32598-13-3	pg/L	549	7	NA	-	-							23				15.6	J
PCB-8	34883-43-7	pg/L	5960	11	NA	-	-	84.8		263		161		1060		105		582	
PCB-80	33284-52-5	pg/L	262	1	NA	-	-												
PCB-81	70362-50-4	pg/L	369	1	NA	-	-												
PCB-82	52663-62-4	pg/L	8920	7	NA	-	-			9.5	J			42.7				30.1	
PCB-83/99	60145-20-2/38380-01-7	pg/L	40500	11	NA	-	-	24.9	J	50.3		49		201		55.7		247	
PCB-84	52663-60-2	pg/L	19300	11	NA	-	-	18.7	J	36.5		27.6		91.6		39		126	
PCB-85/116/117	65510-45-4/18259-05-7/68194-11-6	pg/L	29100	11	NA	-	-	8.2	J	15.1	J	16	J	35.5	J	18.2	J	69.8	
PCB-86/87/97/108/119/125	55312-69-1/38380-02-8/41464-51-1/70362-41-3/56558-17-9/74472-39-2	pg/L	61200	11	NA	-	-	32	J	54.3	J	61.8	J	214		67.5	J	215	
PCB-88/91	55215-17-3/68194-05-8	pg/L	3080	11	NA	-	-	8.8	J	17.9	J	14.5	J	68.1		17.5	J	80.3	
PCB-89	73575-57-2	pg/L	1.5	1	NA	-	-			1.5	J								
PCB-9	34883-39-1	pg/L	393	7	NA	-	-					14.8	J	79.9				49.2	
PCB-90/101/113	68194-07-0/37680-73-2/68194-10-5	pg/L	83800	11	NA	-	-	75.5		97.6		131		367		134		355	
PCB-92	52663-61-3	pg/L	3840	8	NA	-	-	14.1	J	24.3				76.2		23.8		83.3	

Table 6-9
Polychlorinated Biphenyls (PCBs) Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

			Summary Statistics[1]			BTAG Surface		0301-00		0301-02		1001-00		1001-04		1601-00		1601-02	
			Maximum	Number of	Number of	Water Screening	Maximum	9/9/2013		9/9/2013		9/11/2013		9/11/2013		9/11/2013		9/11/2013	
Analyte	**CAS #**	**Unit**	**Detection**	**Detections**	**Exceedances**	**Level[2]**	**EEQ[4]**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
PCB-93/95/98/100/102	73575-56-1/38379-99-6/60233-25-2/39485-83-1/68194-06-9	pg/L	65900	10	NA	-	-	103		132				371		159		415	
PCB-94	73575-55-0	pg/L	265	4	NA	-	-			5.7	J			8.7	J			11.8	J
PCB-96	73575-54-9	pg/L	389	6	NA	-	-			3.5	J			8.4	J			12.4	J
Total DiCB	25512-42-9	pg/L	135000	11	NA	-	-	437		1250		572		4510		745		2190	
Total HpCB	28655-71-2	pg/L	99000	11	NA	-	-	133		227		285		1750		434		424	
Total HxCB	26601-64-9	pg/L	366000	11	NA	-	-	408		435		808		5020		962		1910	
Total MoCB	27323-18-8	pg/L	36100	11	NA	-	-	48.7		204		85.9		1310		228		679	
Total NoCB	53742-07-7	pg/L	4300	8	NA	-	-							54.1		12.3		37.7	
Total OcCB	55722-26-4	pg/L	32500	11	NA	-	-	19.9		58.9		55		428		107		173	
Total PCBs	1111-11-1	pg/L	1320000	11	11	74[3]	**17838**	**3170**		**6920**		**4710**		**27800**		**5390**		**19100**	
Total PeCB	25429-29-2	pg/L	526000	11	NA	-	-	411		623		502		2330		746		2210	
Total TeCB	26914-33-0	pg/L	125000	11	NA	-	-	729		1820		997		5200		1090		5160	
Total TEQ	2222-22-2	pg/L	10.6	11	NA	-	-	0.0015		0.0019		0.0024		0.015		0.003		0.0085	
Total TrCB	25323-68-6	pg/L	58100	11	NA	-	-	985		2300		1410		7220		1070		6310	

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III Biological Technical Assistance Group (BTAG) Fresh Water Screening Benchmarks (7/2006).
3 - Total PCB value.
4 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
B = Bioaccumulative
Highlighted values indicate their exceedances of screening level.

Table 6-10
Dioxin Detected in Pore Water (September 2013)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

Analyte	CAS #	Unit	Summary Statistics[1]			BTAG Surface Water Screening Level[2]	Maximum EEQ[4]	0301-00	0301-02	1001-00	1001-04	1601-00	1601-02
			Maximum Detection	Number of Detections	Number of Exceedances			9/9/2013 Result	9/9/2013 Result	9/11/2013 Result	9/11/2013 Result	9/11/2013 Result	9/11/2013 Result
OCDD	3268-87-9	pg/L	479	2	NA	-	-				239		479
Total TEQ Bird	2222-20-0	pg/L	0.0479	2	NA	-	-				0.0239		0.0479
Total TEQ Fish[3]	2222-21-0	pg/L	0.0479	2	2	**0.003**	**16**				**0.0239**		**0.0479**
Total TEQ Mammal	3333-30-0	pg/L	0.144	2	NA	-	-				0.0717		0.144

1 - Duplicate samples were not included in the summary statistics.
2 - EPA Region III Biological Technical Assistance Group (BTAG) Fresh Water Screening Benchmarks (7/2006).
3 - The BTAG value for 2,3,7,8-TCDD is used as the screening benchmark for fish.
4 - Maximum Ecological Effects Quotient (EEQ) = Maximum detected concentration divided by screening level.
TEQ = Toxicity Equivalent Quotient
Highlighted values indicate their exceedances of screening level.

Table 6-11
Total and Dissolved Metals Summary Statistics in Pore Water (February 2016)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania
Page 1 of 1

Chemical	Frequency of Detection	Mininum Detected	Maximum Detected	Sample of Maximum Detected	Mean of All Samples	Mean of Positive Detects	BTAG Surface Water Screening Level[1]		Maximum EEQ[3]
							Value	Notes	
TOTAL METALS (UG/L)									
ALUMINUM	17/19	26.8	11000	LDCA-PW-0301-04-0216-TM	973	1087	87		**126**
ARSENIC	10/19	1.1	11.8	LDCA-PW-2501-00-0216-TM	2.2	3.7	5		**2**
BARIUM	19/19	69.8	499	LDCA-PW-2501-02-0216-TM	211	211	4		**125**
CADMIUM	4/19	0.2	1.4	LDCA-PW-0301-04-0216-TM	0.19	0.53	0.25		**6**
CALCIUM	19/19	29800	157000	LDCA-PW-0301-04-0216-TM	77029	77029	116000		**1.4**
CHROMIUM	6/19	2.1	37	LDCA-PW-0301-04-0216-TM	5.24	14.4	74	(2)	0.5
COBALT	7/19	1.7	9.2	LDCA-PW-0301-04-0216-TM	2.12	4.89	23		0.4
COPPER	18/19	2.2	68.9 J	LDCA-PW-0301-04-0216-TM	17.4	18.3	9		**8**
IRON	18/19	245	76700	LDCA-PW-2503-00-0216-TM	27432	28956	300		**256**
LEAD	16/19	1.1	425	LDCA-PW-0301-04-0216-TM	27.7	32.8	2.5		**170**
MAGNESIUM	19/19	10200	92300	LDCA-PW-2501-02-0216-TM	38187	38187	82000		**1.1**
MANGANESE	19/19	8.9	6930	LDCA-PW-2503-00-0216-TM	1945	1945	120		**58**
NICKEL	19/19	1.4	22.4	LDCA-PW-0301-04-0216-TM	5.68	5.68	52		0.4
POTASSIUM	19/19	3420	101000	LDCA-PW-1601-00-0216-TM	21072	21072	53000		**1.9**
SELENIUM	2/19	1	1.1	LDCA-PW-LD108HT-00-0216-TM	0.558	1.05	1		**1.1**
SODIUM	19/19	33600	469000	LDCA-PW-1601-00-0216-TM	129708	129708	680000		0.7
THALLIUM	1/19	0.2	0.2	LDCA-PW-0301-04-0216-TM	0.105	0.200	0.8		0.3
VANADIUM	2/19	14.6	31.5 J	LDCA-PW-0301-04-0216-TM	4.66	23.1	20		**1.6**
ZINC	17/19	2.5	327	LDCA-PW-0301-04-0216-TM	33.6	37.4	120		**2.7**
DISSOLVED METALS (UG/L)									
ARSENIC	6/19	1	7.7	LDCA-PW-2501-00-0216-DM	1.50	3.67	5		**1.5**
BARIUM	19/19	64.8	480	LDCA-PW-2501-02-0216-DM	182	182	4		**120**
CADMIUM	1/19	0.3	0.3	LDCA-PW-LD108HT-00-0216-DM	0.111	0.300	0.25		**1.2**
CALCIUM	19/19	29000	147000	LDCA-PW-0301-04-0216-DM	73258	73258	116000		**1.3**
COBALT	6/19	1	6.2	LDCA-PW-2501-02-0216-DM	1.35	3.18	23		0.3
COPPER	19/19	2.9	45.6	LDCA-PW-2501-02-0216-DM	10.8	10.8	9		**5.1**
IRON	16/19	330	76100	LDCA-PW-2503-00-0216-DM	25524	30309	300		**254**
MAGNESIUM	19/19	10100	94000	LDCA-PW-2501-02-0216-DM	36047	36047	82000		**1.1**
MANGANESE	19/19	4.6	6870	LDCA-PW-2503-00-0216-DM	1909	1909	120		**57**
NICKEL	19/19	1.1	9.9	LDCA-PW-2501-02-0216-DM	3.62	3.62	52		0.2
POTASSIUM	19/19	3470	87500	LDCA-PW-1601-00-0216-DM	19371	19371	53000		**1.7**
SELENIUM	3/19	1	2.1	LDCA-PW-1601-00-0216-DM	0.642	1.40	1		**2.1**
SODIUM	19/19	35000	476000	LDCA-PW-2501-02-0216-DM	127974	127974	680000		0.7
VANADIUM	2/19	5.4 J	6.9 J	LDCA-PW-2501-00-0216-DM	2.88	6.15	20		0.3
ZINC	13/19	2.1	28.3	LDCA-PW-LD126-00-0216-DM	7.17	10.0	120		0.2

Footnotes:
1 - EPA Region III Biological Technical Assistance Group (BTAG) Fresh Water Screening Benchmarks (7/2006).
2 - Based on trivalent chromium
3 - Maximum Ecological Effects Quotient = Maximum detected concentration divided by BTAG screening level.
Shaded cells have EEQs greater than 1.0.

Table 6-12
Summary of Analytes Initially Selected as Chemicals of Potential Concern in Pore Water
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

Analyte	May 2013	September 2013	Total Metals 2016	Dissolved Metals 2016
1,4-Dioxane	NC	NC		
2-Methylphenol	X			
Anthracene	X	X		
Benzaldehyde		NC		
Benzo(a)anthracene	X	X		
Benzo(a)pyrene	X	X		
Benzo(b)fluoranthene	X			
Benzo(g,h,i)perylene	X			
Benzo(k)fluoranthene	X			
Caprolactam	NC			
Carbazole	NC			
Chrysene	X			
Dibenzo(a,h)anthracene	X			
Fluoranthene	X	X		
Indeno(1,2,3-cd)pyrene	X			
Pentachlorophenol		X		
Phenanthrene	X	X		
Pyrene	X	X		
4,4'-DDD	X			
4,4'-DDT	X	X		
alpha-Chlordane	X	X		
beta-BHC		X		
Endrin aldehyde	NC	X		
Endrin ketone	NC	X		
gamma-BHC (Lindane)	X			
gamma-Chlordane	X	X		
Heptachlor		X		
Heptachlor epoxide	X	X		
Total PCBs	X	X		
Total TEQ Fish		X		
Aluminim			X	
Arsenic			X	X
Barium			X	X
Cadmium			X	X
Copper			X	X
Iron			X	X
Lead			X	
Manganese			X	X
Selenium			X	X
Vanadium			X	
Zinc			X	

NC - No Criteria
X - Maximum concentrtaions exceeded screening level
Note: Calcium, magnesium, potassium, and sodium were not selected as COPCs, because they are essential nutrients that can be tolerated by living systems even at high concentrations.

Table 6-13
Select Metals Detected in Pore Water (February 2016)
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

Location	Sample Location	Sample ID	Sample Date		Aluminum	Arsenic	Barium	Cadmium	Copper	Iron	Lead	Manganese	Selenium	Vanadium	Zinc
				BTAG VALUE	87	5	4	0.25	9	300	2.5	120	1	20	120
Samples Collected from East Side of the Creek															
PW-LD108	PW-LD108HT-00	LDCA-PW-LD108HT-00-0216-DM	20160225				296	0.3	12.9	683		157	1.1		21.4
		LDCA-PW-LD108HT-00-0216-TM	20160225		1,290	1.2	380	0.3	15.5	2,460	3.5	180	1.1		32.3
	PW-LD108-00	LDCA-PW-LD108-00-0216-DM	20160226				181		10.6	330		162	1		10.1
		LDCA-PW-LD108-00-0216-TM	20160226		1,310	2.1	214	0.2	16.9	2,970	18.5	191	1		37.1
PW-LD126	PW-LD126-00	LDCA-PW-LD126-00-0216-DM	20160225				186		10.5	11,100		1,170			28.3
		LDCA-PW-LD126-00-0216-TM	20160225		613	1.8	206		18.3	12,100	10.2	1,210			54.7
PW-0301	PW-0301-00	LDCA-PW-0301-00-0216-DM	20160225				169		6.2	40,100		3,100			
		LDCA-PW-0301-00-0216-TM	20160225		384		186		8.9	40,900	11.4	3,080			13
	PW-0301-02	LDCA-PW-0301-02-0216-DM	20160225				177		3.5	40,700		3,340			2.1
		LDCA-PW-0301-02-0216-DM-AVG	20160225				177		3.5	40,700		3,340			2.1
		LDCA-PW-0301-02-0216-DM-D	20160225				164		3	50,200		4,020			
		LDCA-PW-0301-02-0216-TM	20160225		120		183		4.3	40,300	1.3	3,300			5.2
		LDCA-PW-0301-02-0216-TM-AVG	20160225		86.15		185		3.55	40,500	0.9	3,320			3.85
		LDCA-PW-0301-02-0216-TM-D	20160225		52.3		187		2.8	40,700		3,340			2.5
	PW-0301-04	LDCA-PW-0301-04-0216-DM	20160225			1.2	177		6.1	51,700		1,580			3
		LDCA-PW-0301-04-0216-TM	20160225		11,000	4.7	380	1.4	68.9	70,300	425	2,080		31.5	327
PW-1601	PW-1601-00	LDCA-PW-1601-00-0216-DM	20160225			3.7	196		22.8	4,870		233	2.1	5.4	5.3
		LDCA-PW-1601-00-0216-TM	20160225		110	4.5	218		30.7	5,700	1.8	282			6.6
PW-2501	PW-2501-00	LDCA-PW-2501-00-0216-DM	20160225			7.7	332		30.5	20,500		419		6.9	7.9
		LDCA-PW-2501-00-0216-TM	20160225		1,870	11.8	433	0.2	57.6	28,200	31.3	522		14.6	74.5
	PW-2501-02	LDCA-PW-2501-02-0216-DM	20160225			7.3	480		45.6	40,600		2,330			2.9
		LDCA-PW-2501-02-0216-TM	20160225		554	7	499		54.5	41,900	3.6	2,480			6.4
			Dissolved Concentrations	Maximum	ND	8	480	0.3	46	51,700	ND	4,020	2.1	7	28
				Average(1)	ND	5.0	244	0.3	16.5	23,398	ND	1,388	1.4	6.2	10.1
			Total Concentrations	Maximum	11,000	12	499	1.4	69	70,300	425	3,340	1.1	32	327
				Average(1)	1,913	4.7	300	0.5	31	27,226	56	1,483	1.1	23	62
Samples Collected from West Side of the Creek															
PW-LD103	PW-LD103-00	LDCA-PW-LD103-00-0216-DM	20160226				64.8		4.3			61.5			12.8
		LDCA-PW-LD103-00-0216-TM	20160226		139		69.8		6.4	245	2.1	70.9			16.8
	PW-LD103-02	LDCA-PW-LD103-02-0216-DM	20160226				90.7		12.1			12.3			10.2
		LDCA-PW-LD103-02-0216-TM	20160226				86.1		10.9			10.4			9.6
	PW-LD103-04	LDCA-PW-LD103-04-0216-DM	20160226				107		2.9	5,860		845			
		LDCA-PW-LD103-04-0216-TM	20160226		26.8		106		2.2	5,740	1.4	813			2.6
PW-0303	PW-0303-00	LDCA-PW-0303-00-0216-DM	20160225				99.5		8.8			4.6			21
		LDCA-PW-0303-00-0216-TM	20160225		125		109		8.6	250	1.9	8.9			23.1
	PW-0303-02	LDCA-PW-0303-02-0216-DM	20160225				156		7.2	15,600		767			2
		LDCA-PW-0303-02-0216-TM	20160225		87.1		161		8.9	16,400	3.2	776			3.9
PW-1603	PW-1603-00	LDCA-PW-1603-00-0216-DM	20160226			1	123		5.4	34,200		4,210			2.4
		LDCA-PW-1603-00-0216-TM	20160226		559	1.7	134		5.5	33,700	6.6	4,030			10.8
	PW-1603-02	LDCA-PW-1603-02-0216-DM	20160226				113		3.6	31,500		3,580			
		LDCA-PW-1603-02-0216-TM	20160226		33.6		119		3.2	31,900	1.1	3,540			
	PW-1603-04	LDCA-PW-1603-04-0216-DM	20160226				157		3.1	50,000		4,020			
		LDCA-PW-1603-04-0216-DM-AVG	20160226				157		3.1	50,000		4,020			
		LDCA-PW-1603-04-0216-DM-D	20160226				178		3.7	40,200		3,270			
		LDCA-PW-1603-04-0216-TM	20160226				165		3.3	51,000		4,080			
		LDCA-PW-1603-04-0216-TM-AVG	20160226			0.8	166		2.8	50,850		4,065			3.25
		LDCA-PW-1603-04-0216-TM-D	20160226			1.1	166		2.2	50,700		4,050			5.5
PW-2503	PW-2503-00	LDCA-PW-2503-00-0216-DM	20160226			1.1	218		6	76,100		6,870			2.9
		LDCA-PW-2503-00-0216-TM	20160226		248	1.1	228		6.1	76,700	3	6,930			10.4
	PW-2503-02	LDCA-PW-2503-02-0216-DM	20160226				129		2.9	61,100		3,410			
		LDCA-PW-2503-02-0216-TM	20160226		35.5		130			60,400		3,370			
			Dissolved Concentrations	Maximum	ND	1.1	218	ND	12.1	76,100	ND	6,870	ND	ND	21.0
				Average(1)	ND	1.1	126	ND	5.6	39,194	ND	2,378	ND	ND	8.6
			Total Concentrations	Maximum	559	1.7	228	ND	10.9	76,700	6.6	6,930	ND	ND	23.1
				Average(1)	157	1.2	131	ND	6.1	30,687	2.8	2,361	ND	ND	10.1

BTAG = EPA Region III Biological Technical Assistance Group Fresh Water Screening Benchmarks (7/2006)

Above BTAG Value

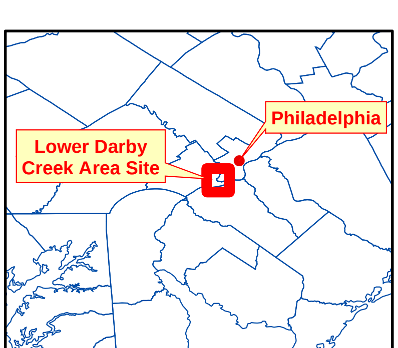
ND - Not Detected

DM - Dissolved Metals TM - Total metals

1 - The average concentrations were calculated using the average of the original and duplicate sample results.

FIGURES

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\GENERAL LOCATION MAP.MXD MKB 11/17/2017



3,000 1,500 0 3,000 6,000
Feet

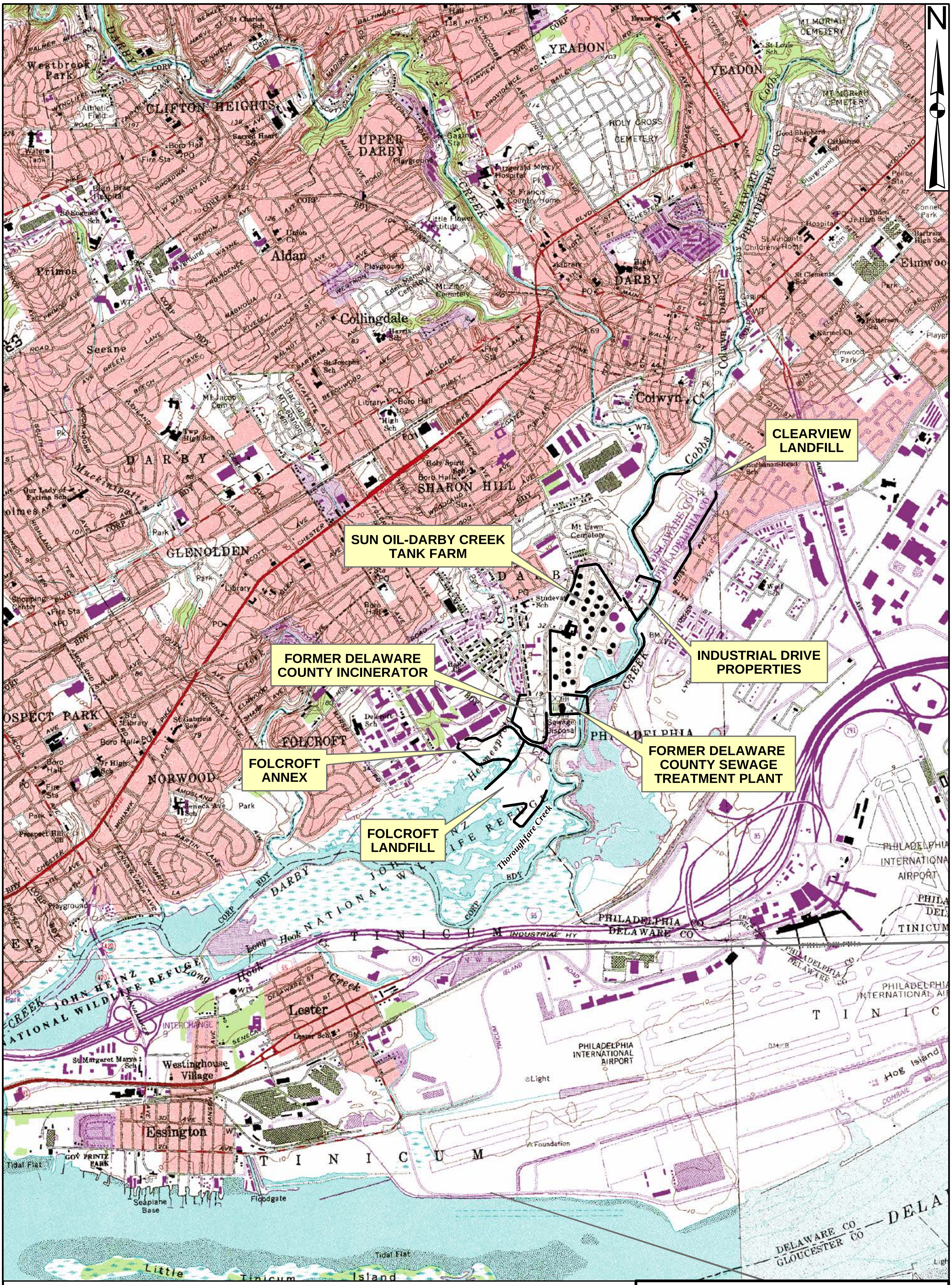
This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

TETRA TECH

SITE LOCATION
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
General Location Map	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 1-1	0	11/17/2017



3,000 1,500 0 3,000 6,000

Feet

Background image a combination of four USGS Digital Raster Graphics (DRG) for the Bridgeport, NJ; Landsdowne, PA; Philadelphia, PA; and Woodsbury, NJ Quadrangles with cropped collars.**

TETRA TECH

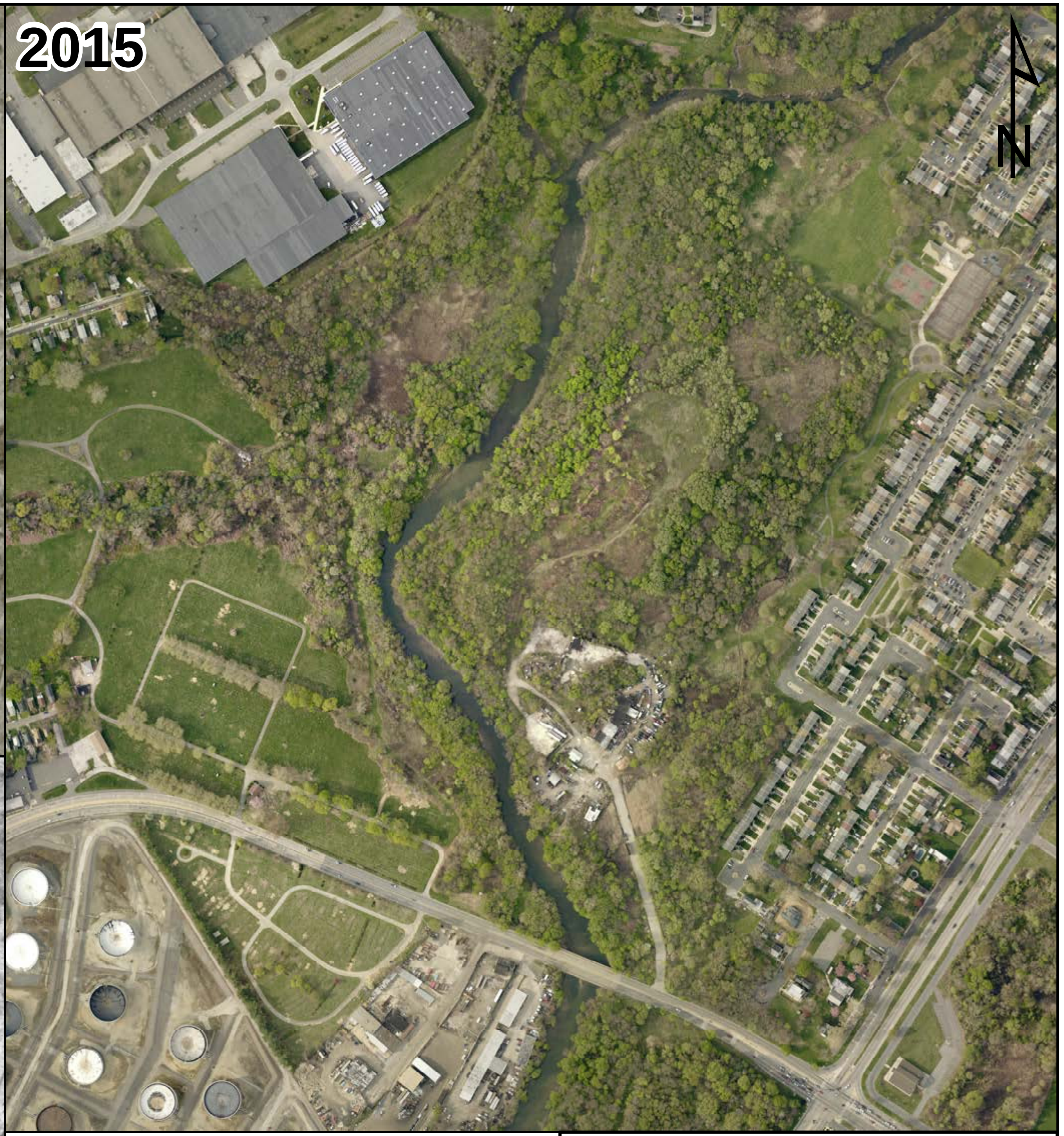
SOURCES OF CONTAMINATION PROPOSED TO NATIONAL PRIORITIES LIST (NPL) FOR

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
Sources of Contamination NPL	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 1-2	0	03/20/17

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURES\SOURCES OF CONTAMINATION NPL.MXD MKB 3/20/2017



Source: USEPA, 1984

LEGEND

Access Road	DKM - Dark-Toned Material
Drainage	GS - Ground Scar
Historical Boundary	GST - Ground Stain
New Residences	LTM - Light-Toned Material
Site Boundary	MM - Mounted Material
Sloped Edge of Fill	S - Structure
Wetlands	SL - Standing Liquid

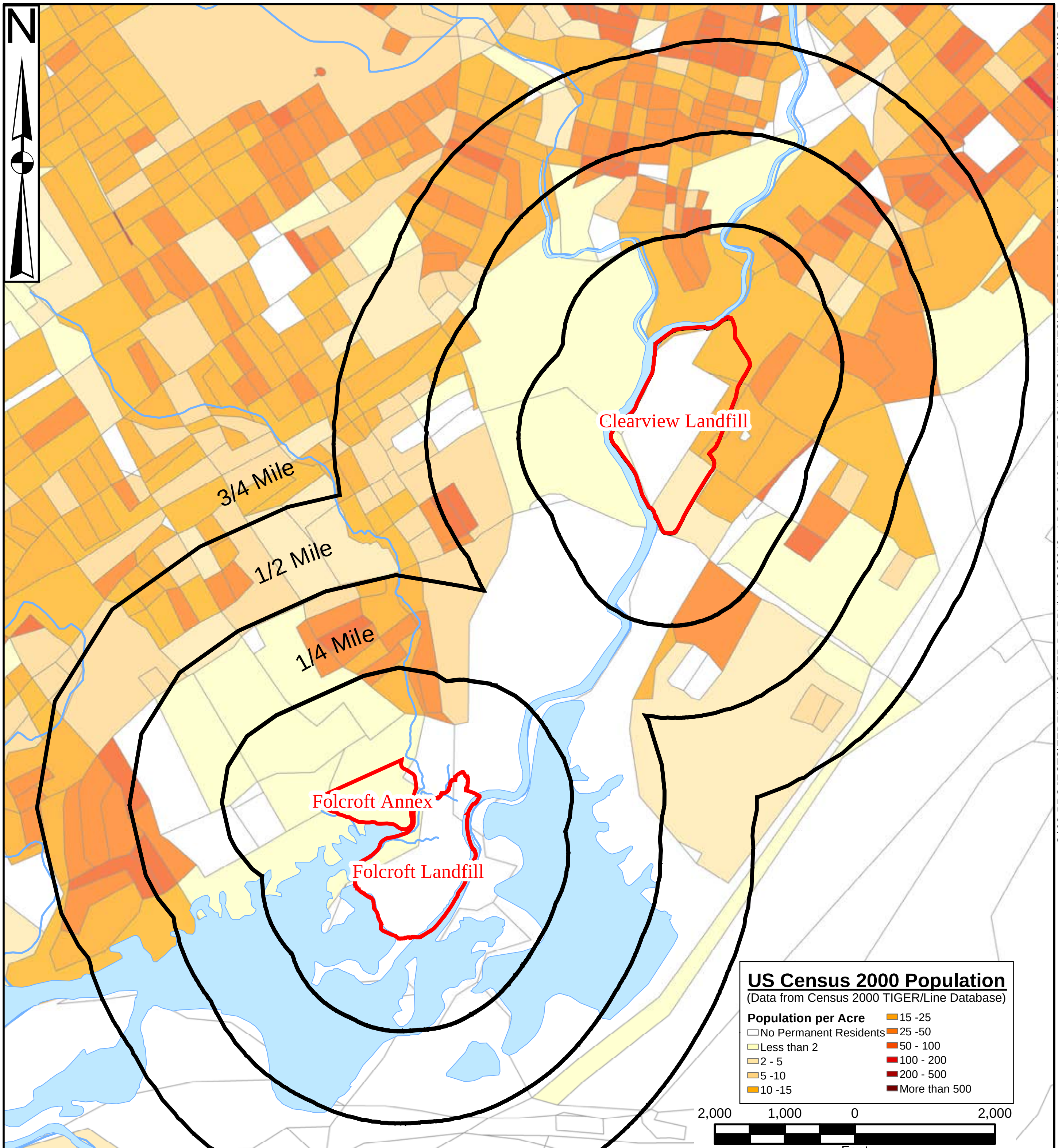
TETRA TECH

HISTORICAL AERIAL PHOTOS OF CLEARVIEW LANDFILL

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
Historical Aerials	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 1-3	0	03/07/17



Sources: Streams digitized from Digital Ortho Quads (DOQs), Demographic from US Census, UTM Zone 18 Meters.

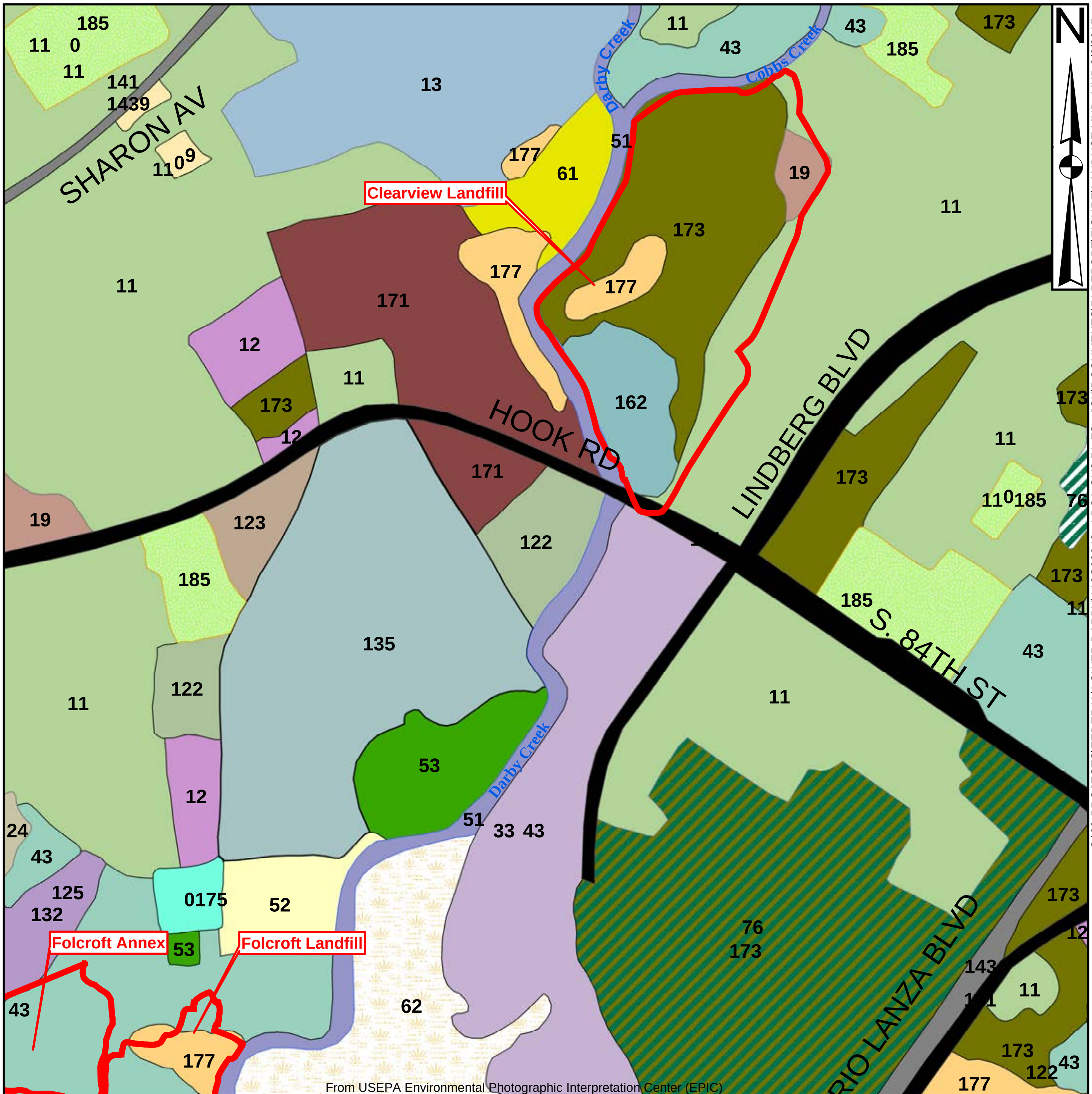
This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\CENSUS DATA.MXD MKB 3/6/2017

TETRA TECH

DEMOGRAPHY (2010 US CENSUS)
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT (OU-3)
DELAWARE AND PHILADELPHIA COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	Census Data
REV	0
DATE	03/06/17
FIGURE NUMBER	**FIGURE 2-1**



Land Use Classification (Anderson et al, 1976)

- 0 No Data
- 9 Perennial Snow or Ice
- 11 Residential
- 12 Commercial
- 13 Industrial
- 19 Recreational
- 24 Farmsteads
- 33 Mixed Open Brushlands
- 43 Mixed Forest
- 51 Waterways
- 52 Sewage Treatment
- 53 Man-Made Impoundments
- 61 Forested Wetlands
- 62 Non-Forested Wetlands
- 76 Transitional
- 122 Commercial Vehicle-Related
- 123 Junkyard
- 125 Warehousing
- 132 Light Industrial
- 135 Tank Farms
- 141 Highways
- 143 Railroads
- 162 Commercial/Light Industrial
- 171 Cemeteries
- 173 Vacant Urban Lands
- 175 Incinerators
- 177 Dumps
- 185 Educational

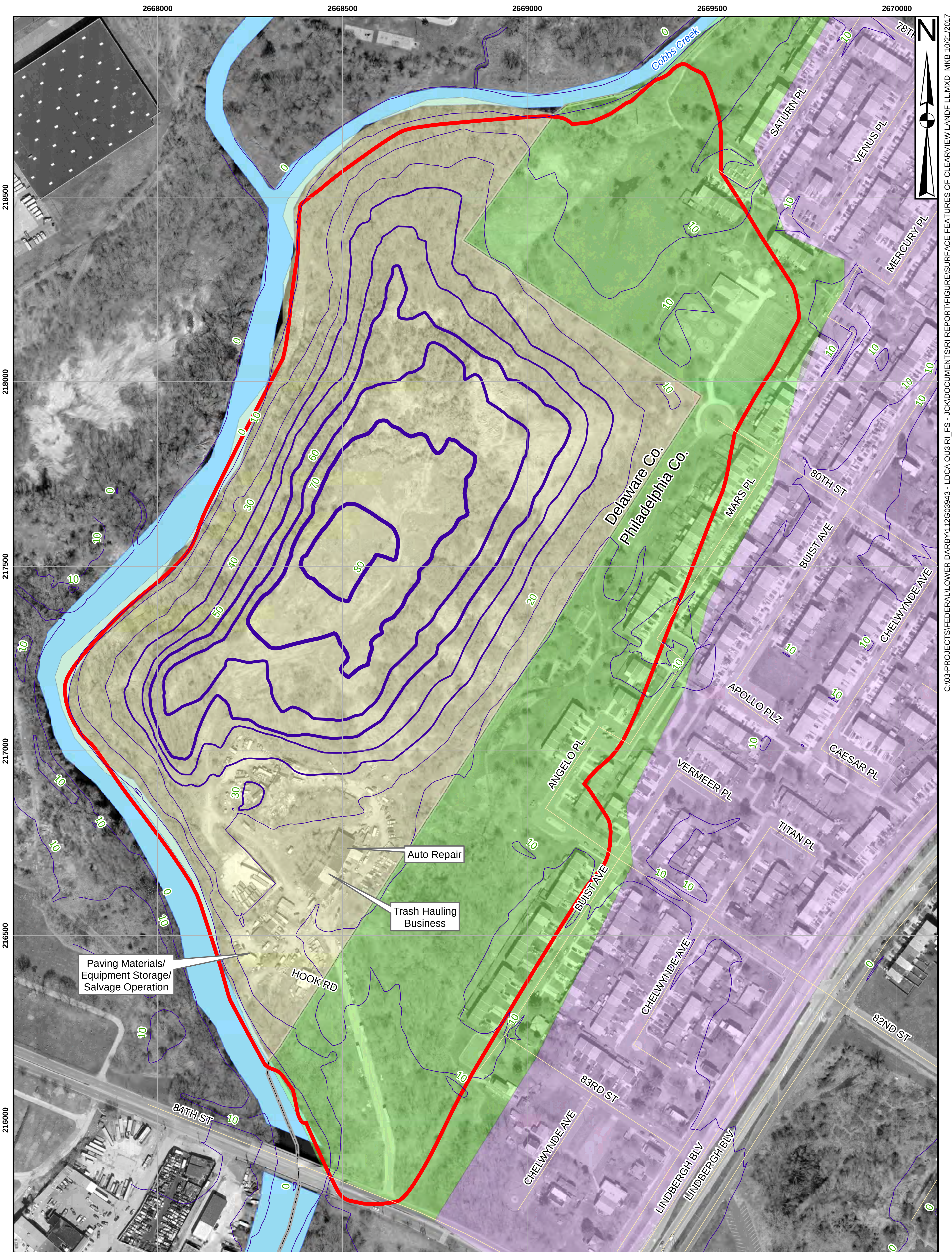
This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

1,000 500 0 1,000
Feet

TETRA TECH

LAND USE IN VICINITY OF CLEARVIEW LANDFILL
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT (OU-3)
DELAWARE AND PHILADELPHIA COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	LandUse
REV	0
DATE	03/06/17
FIGURE NUMBER	**FIGURE 2-2**



Grid in PA State Plane South (ft)

Legend

- Clearview Landfill
- City Park
- Eastwick Neighborhood
- County Boundary
- 10 Elevation Above Mean Sea Level (ft)
- Elevation Contour
- Historical Extent of Landfill Footprint

250 125 0 250 500

Feet

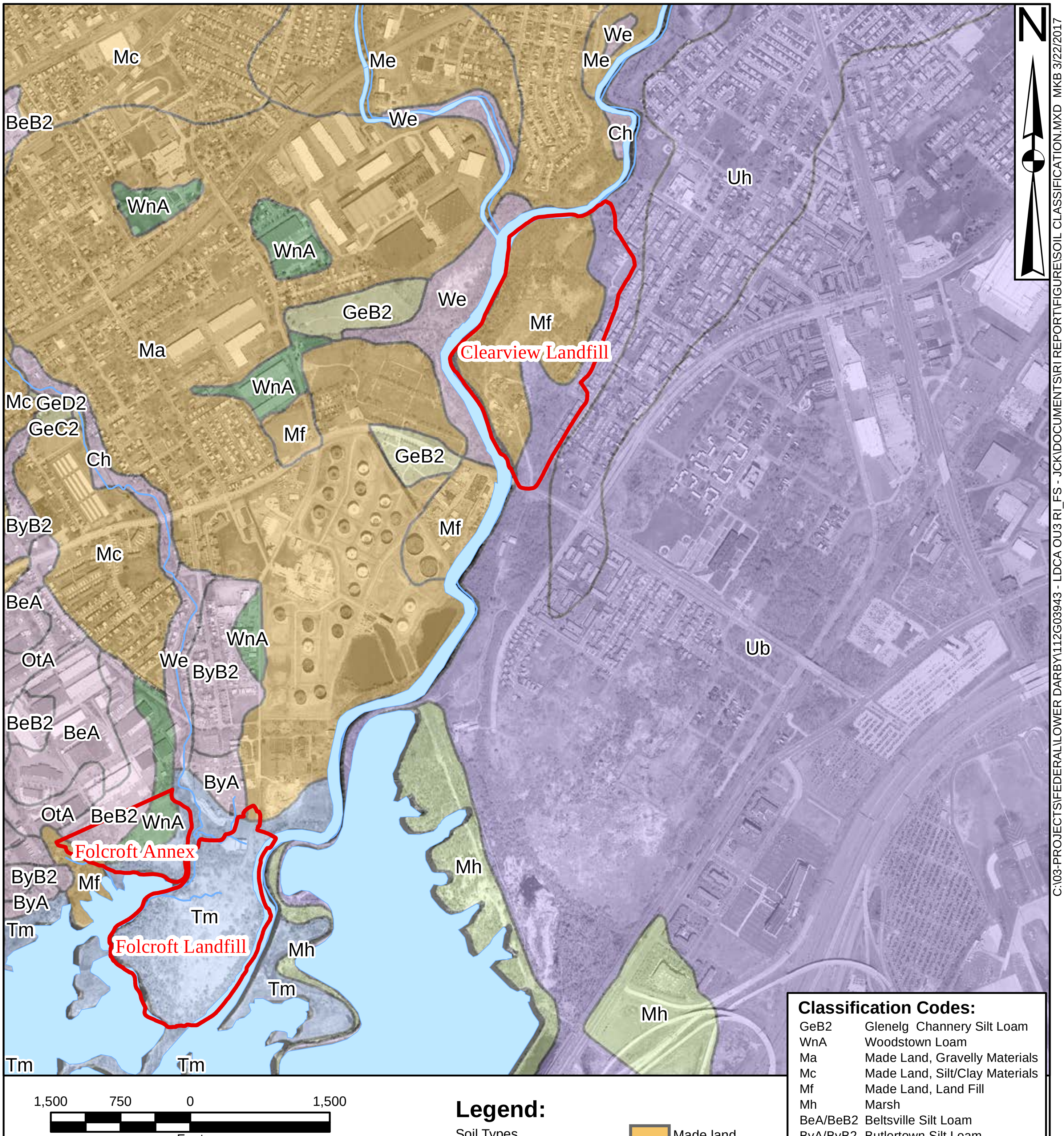
This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

TETRA TECH

SURFACE FEATURES OF CLEARVIEW LANDFILL

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE	
Surface Features of Clearview Landfill	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 2-3	0	10/21/17



Sources: Streams digitized from Digital Ortho Quads (DOQs), UTM Zone 18 Meters.

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

Legend:

Soil Types
(From NRCS WSS Website)

- Channery silt loam
- Loam
- Silt loam
- Made land
- Urban land
- Marsh
- Tidal marsh
- Landfill Boundary

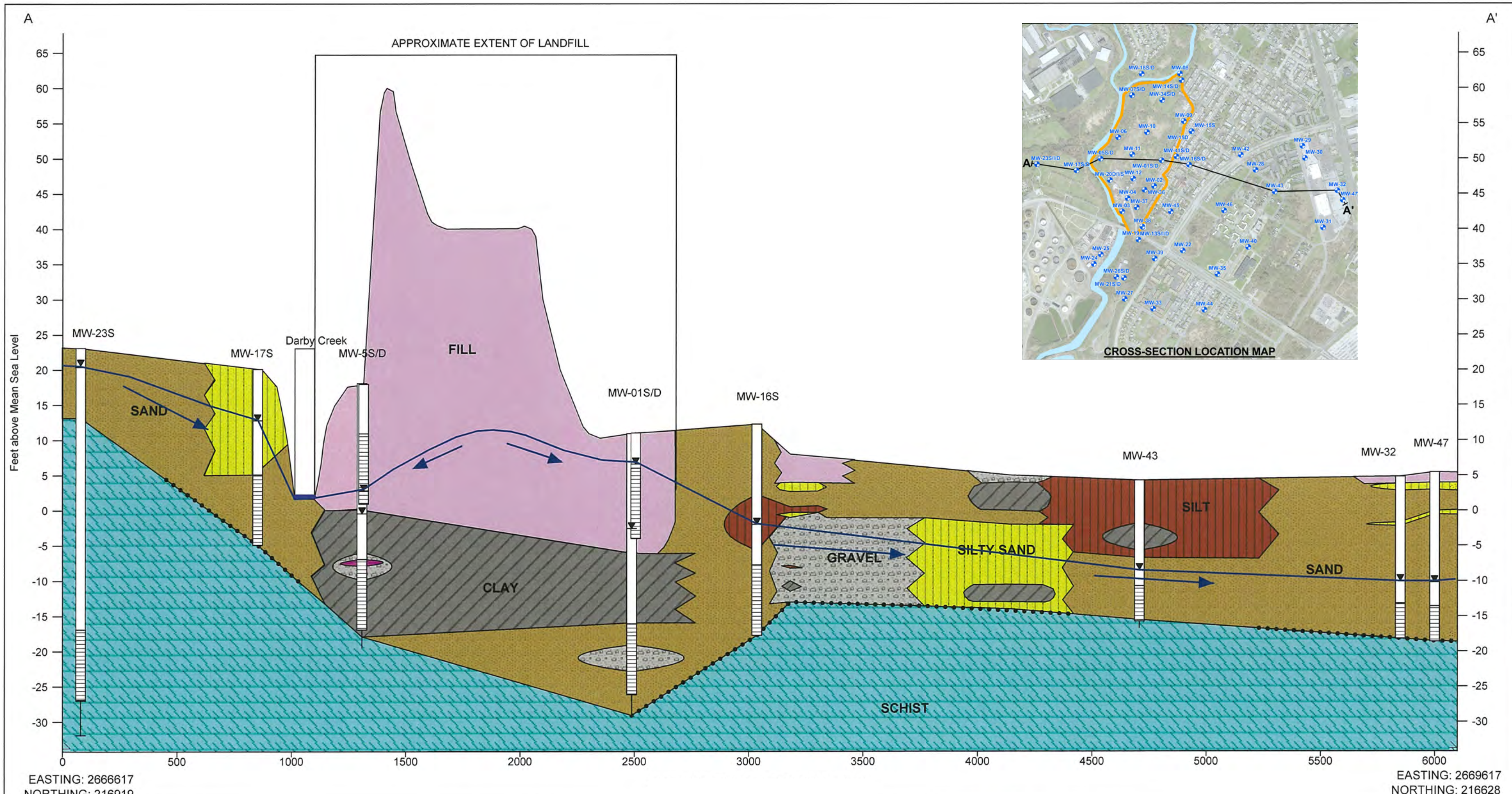
Classification Codes:

GeB2	Glenelg Channery Silt Loam
WnA	Woodstown Loam
Ma	Made Land, Gravelly Materials
Mc	Made Land, Silt/Clay Materials
Mf	Made Land, Land Fill
Mh	Marsh
BeA/BeB2	Beltsville Silt Loam
ByA/ByB2	Butlertown Silt Loam
Ch	Chewacla Silt Loam
OtA	Othello Silt Loam
Ub/Uh	Urban Lands
Tm	Tidal Marsh
We	Wehadkee Silt Loam

TETRA TECH

SOILS CLASSIFICATION MAP
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT (OU-3)
DELAWARE AND PHILADELPHIA COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	Soil Classification
REV	DATE
0	03/22/17
FIGURE NUMBER	**FIGURE 2-4**



Tetra Tech
240 Continental Drive, Suite 200
Newark, DE 19713

Project 112G03943

TETRA TECH

Geologic Cross Section A-A'

Figure 2-5

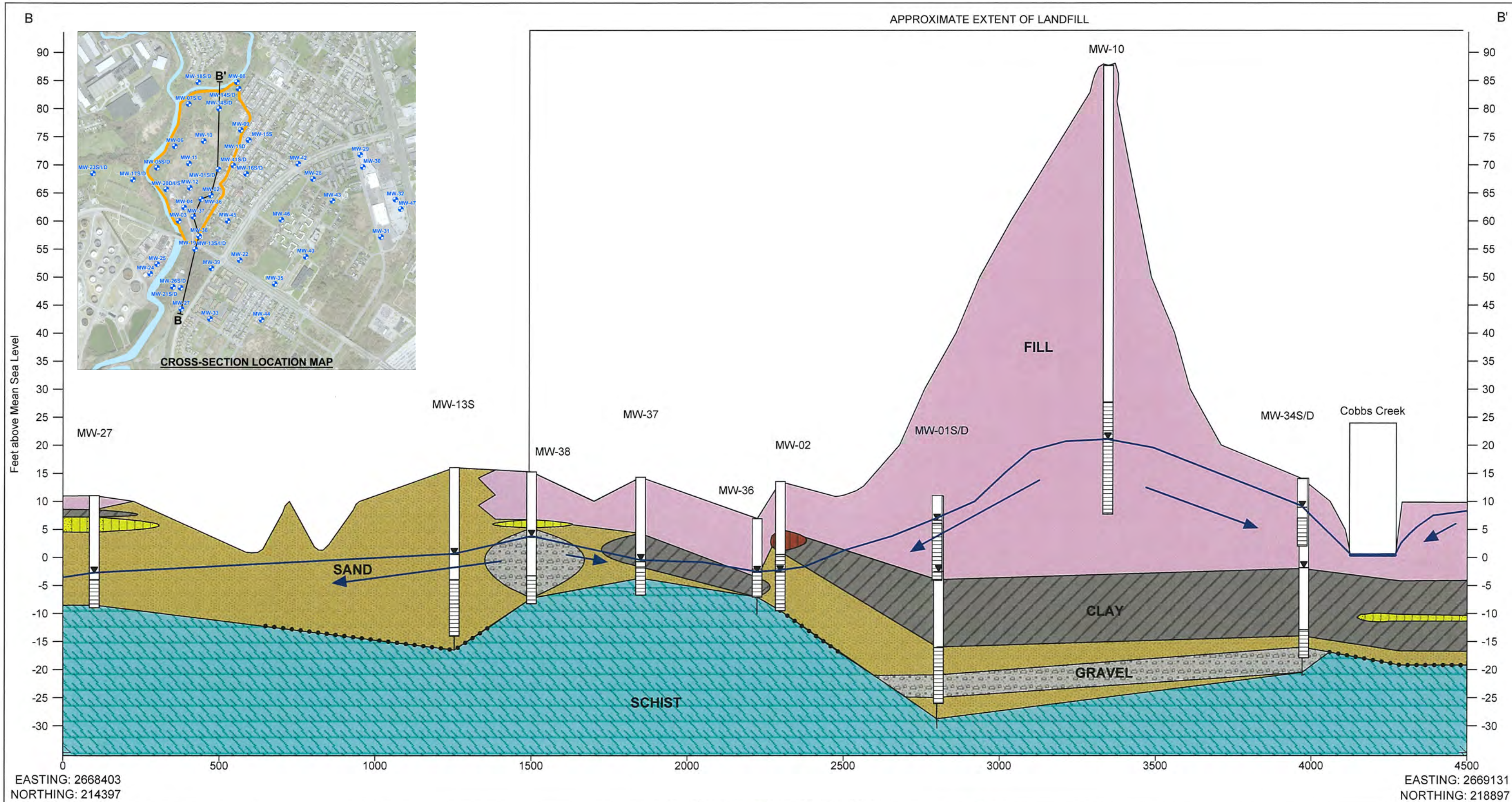
Shallow Aquifer

Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

LEGEND

- Sand
- Silty Sand
- Clay
- Silt
- Gravel
- Peat
- Schist
- Fill Materials
- Extensions in the Lithology
- Water Level

11-9-2017 C:\Users\Robert.Shepherd\Documents\M-Tech\Clearview-Lower Darby Landfill\All Logs\A-A' transect\RedlineShallowCalculatedYellowsV3.cro



Tetra Tech
240 Continental Drive, Suite 200
Newark, DE 19713

Project 112G03943

TETRA TECH

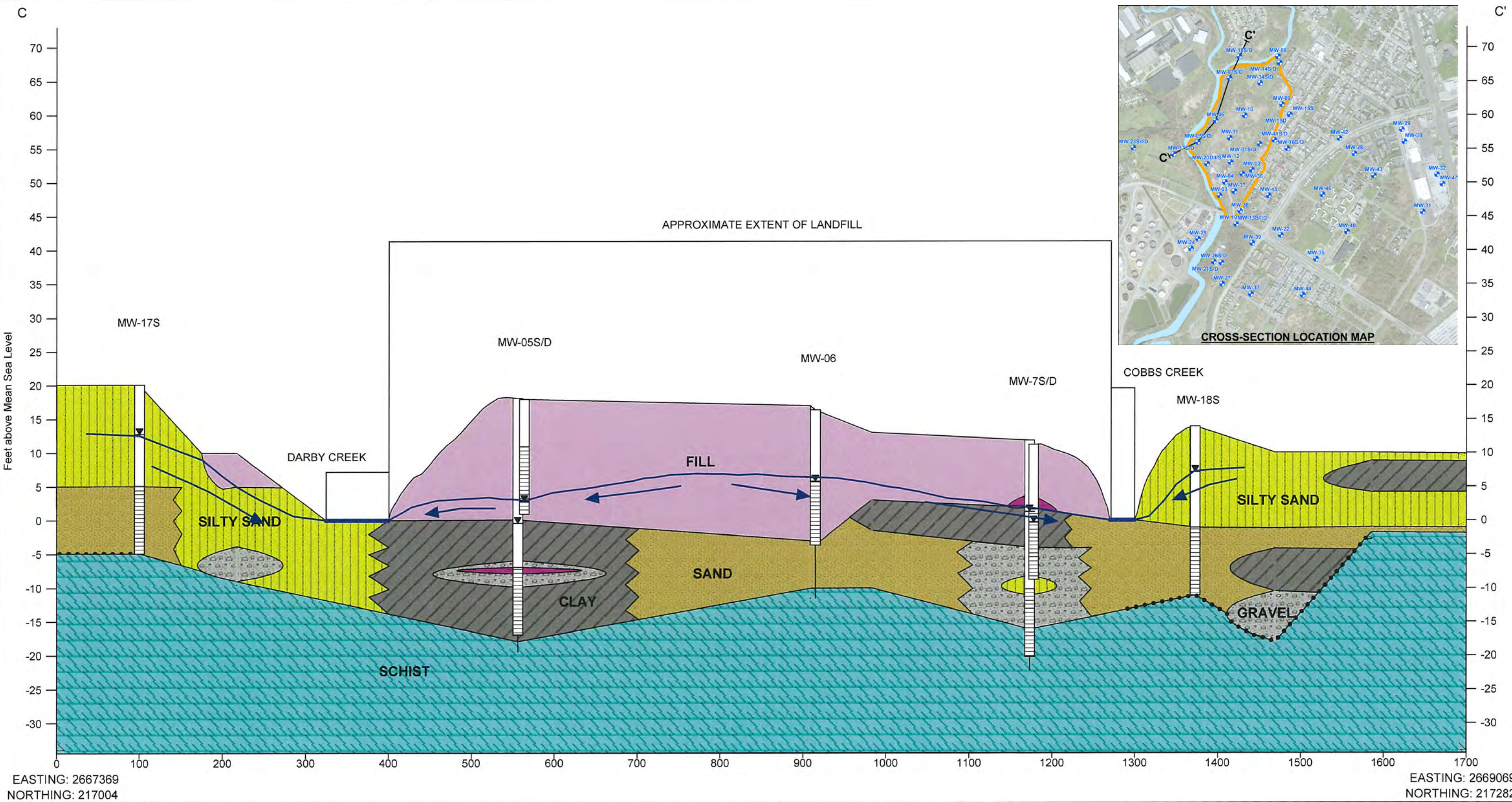
Geologic Cross Section B to B'

Figure 2-6
Shallow Aquifer
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

LEGEND

- Sand
- Silty Sand
- Clay
- Silt
- Gravel
- Peat
- Schist
- Fill Materials
- Extensions in the Lithology
- Water Level

11-9-2017 C:\Users\Robert.Shepherd\Documents\M-Tech\Clearview-Lower Darby Landfill\All Logs\B'-B transect\BtoB'calculatedvar2.cro



Tetra Tech
240 Continental Drive, Suite 200
Newark, DE 19713

Project 112G03943

TETRA TECH

Geologic Cross Section C to C'

Figure 2-7
Shallow Aquifer
Lower Darby Creek Area (LDCA) Site
Operable Unit 3 (OU-3) - Clearview Landfill Groundwater
Delaware and Philadelphia Counties, Pennsylvania

LEGEND

- Sand
- Silty Sand
- Clay
- Silt
- Gravel
- Peat
- Schist
- Fill Materials
- Extensions in the Lithology
- Water Level

11-9-2017 C:\Users\Robert.Shepherd\Documents\M-Tech\Clearview-Lower Darby Landfill\All Logs\C'-C transect\C' to Cv3.cro

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\GEOLOGY.MXD MKB 3/6/2017

Legend

QUATERNARY
Pleistocene - Sangamonian Stage

- **Qt - Trenton Gravel** Gray or pale-reddish-brown, very gravelly sand interstratified with crossbedded sand and clay-silt beds; includes some areas of Holocene alluvium and swamp deposits.

TERTIARY
Miocene

- **Tpb - Pensauken and Bridgeton Fms Undiv** Undifferentiated dark-reddish-brown, cross-stratified, feldspathic quartz sand and some thin beds of fine gravel and rare layers of clay or silt.

PROBABLY LOWER PALEOZOIC

- **Xgr - Granite Gneiss and Granite** Includes Springfiled Granodiorite (granitized Wassahickon) in Philadelphia area.
- **Tbm - Bryn Mawr Fm** High-level terrace deposites; reddish-brown gravelly sand and some silt. Age uncertain.
- **Xw - Wissahickon Fm (Oligioclase Mica Schist)** Includes some hornblende gneiss, some augen gneiss, and some quartz-rich and feldspar-rich members due to various degrees of granitization.

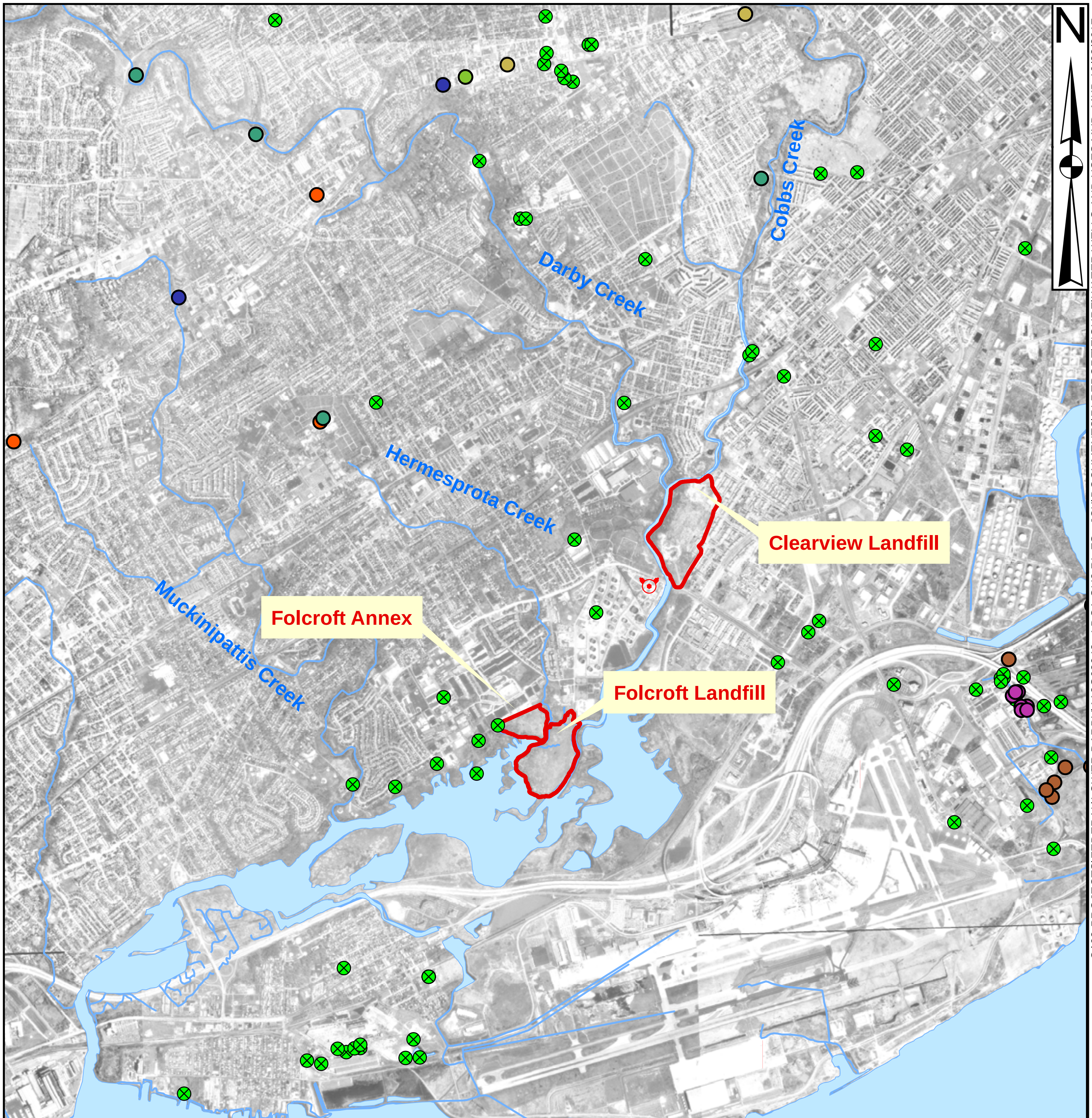
4,000 2,000 0 4,000
Feet

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

TETRA TECH

REGIONAL GEOLOGY
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT (OU-3)
DELAWARE AND PHILADELPHIA COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	Geology
REV	0
DATE	03/06/17
FIGURE NUMBER	**FIGURE 2-8**



Legend

Well Use

- COMMERCIAL
- DEWATER
- DOMESTIC
- FIRE
- INDUSTRIAL
- OTHER (Withdrawal/observation)
- PUBLIC SUPPLY
- RECREATION
- UNUSED

Historical Extent of Landfills

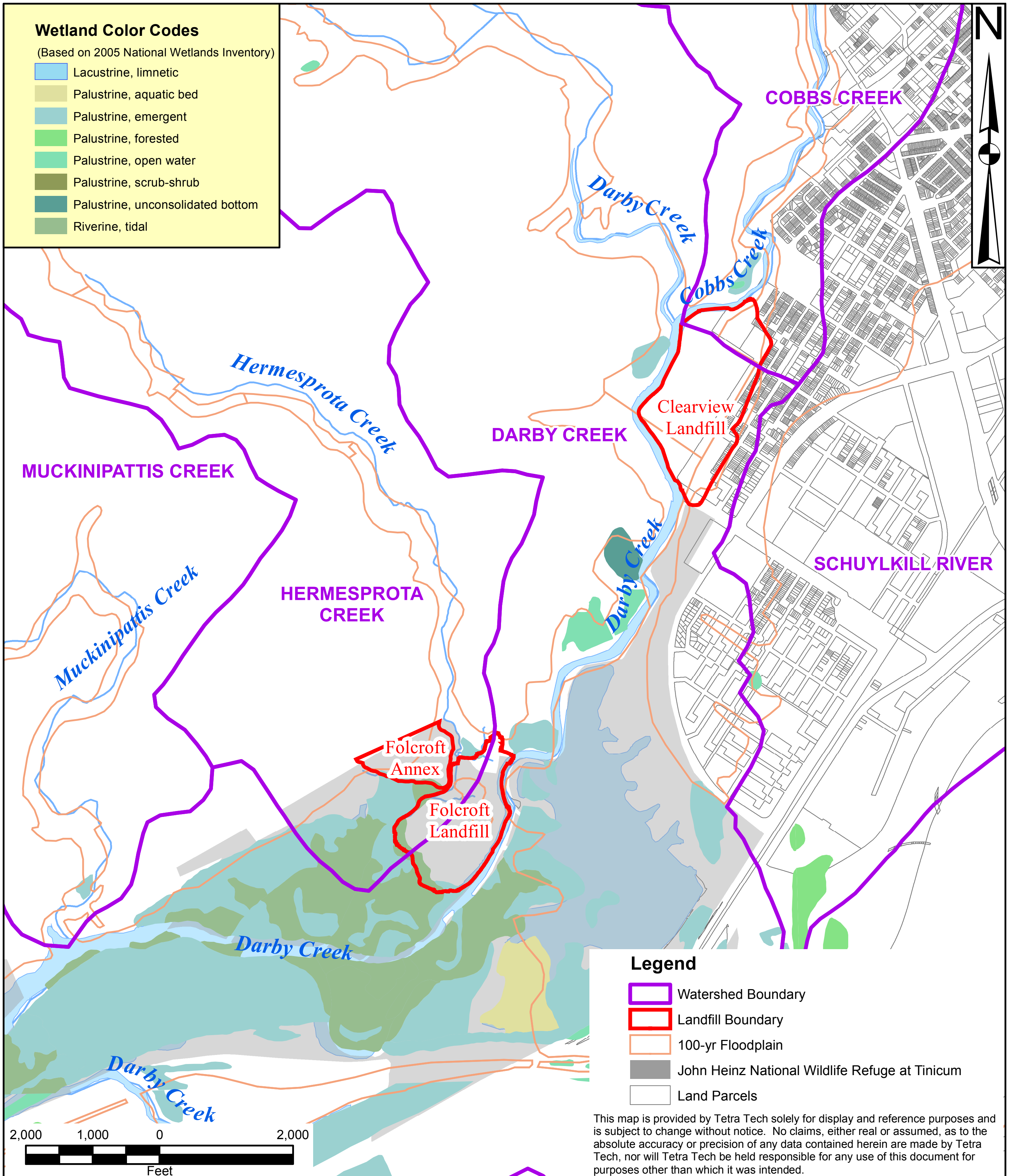
4,000 2,000 0 4,000
Feet

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

TETRA TECH

WATER WELLS AND THEIR USE
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT (OU-3)
DELAWARE AND PHILADELPHIA COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	Water Wells and Uses
REV	0
DATE	10/28/17
FIGURE NUMBER	**FIGURE 2-9**

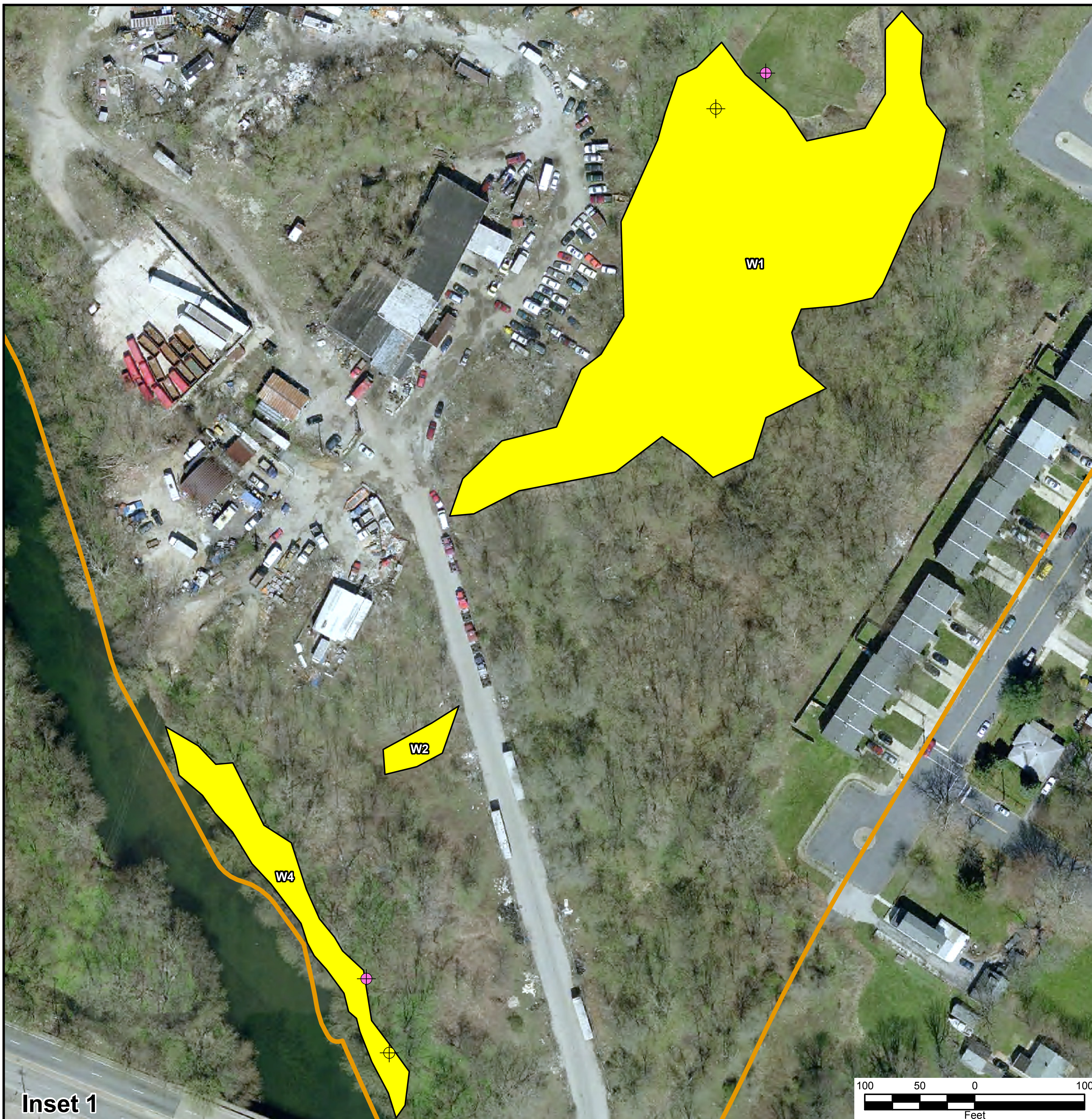


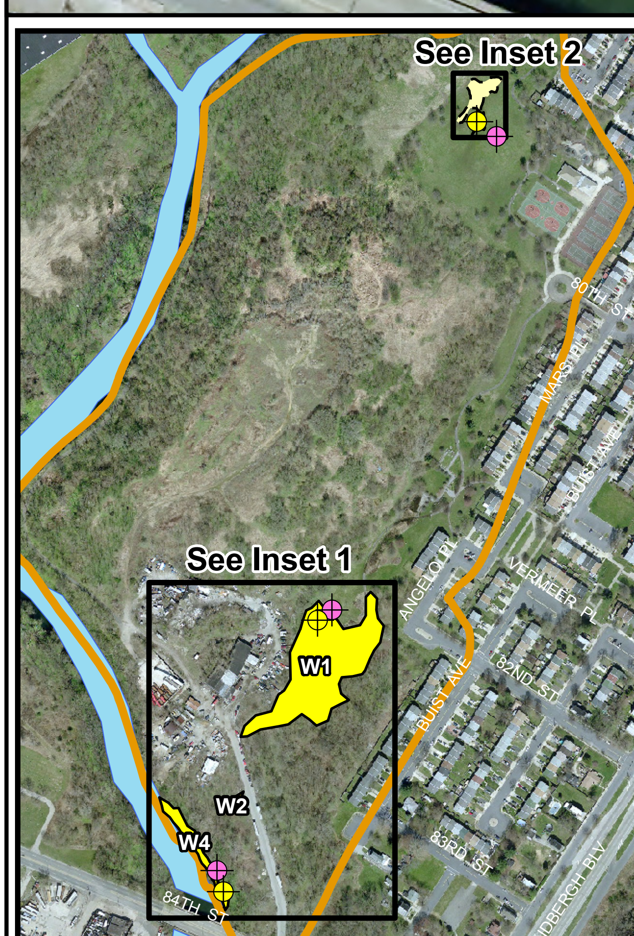
C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURES\SURFACE WATER FEATURES.MXD MKB 11/10/2017

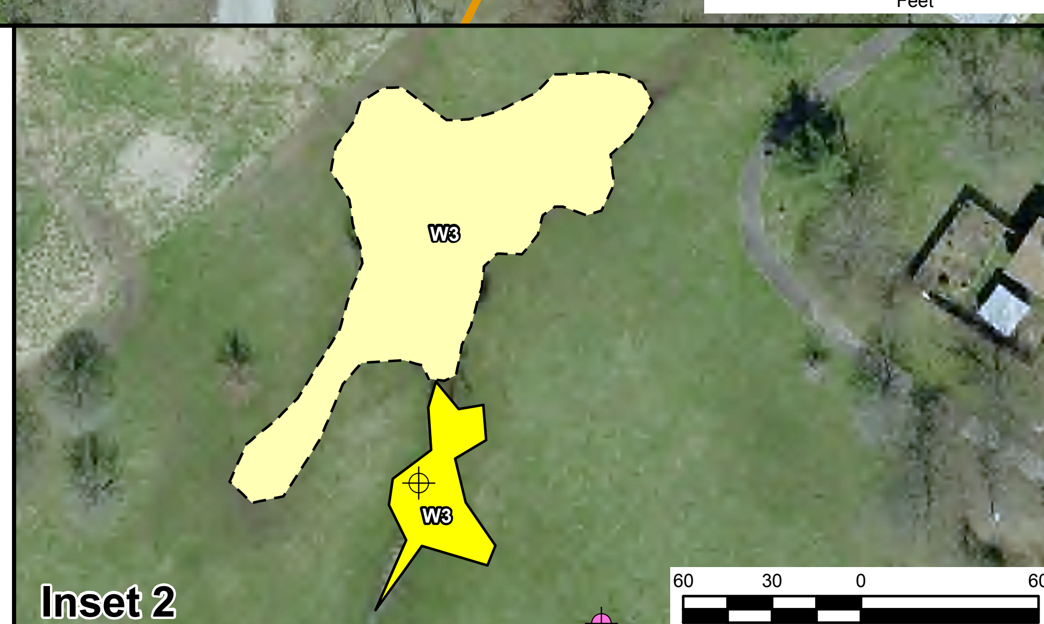
TETRA TECH

SURFACE WATER FEATURES
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT (OU-3)
DELAWARE AND PHILADELPHIA COUNTIES, PENNSYLVANIA

SCALE	
AS NOTED	
FILE	
Surface Water Features	
REV	DATE
0	11/10/17
FIGURE NUMBER	
FIGURE 2-10	







Legend

- Upland Plot
- Wetland Plot
- Wetland
- Digitized from past aerial imagery due to high vegetation cover and dry conditions at the time of sampling.
- Historical Extent of Clearview Landfill

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

TETRA TECH

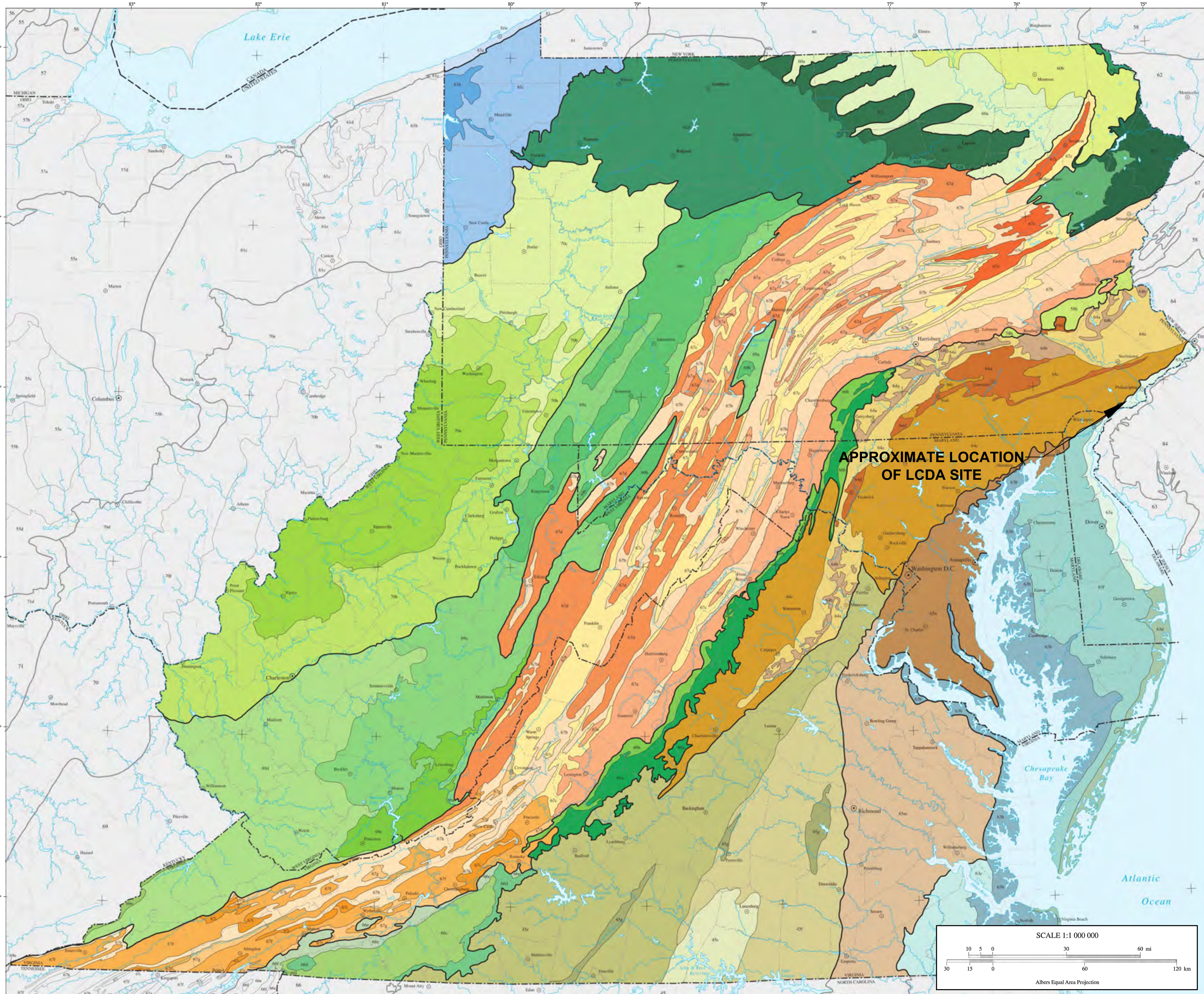
EXISTING ON-SITE WETLANDS IDENTIFIED DURING WETLAND INVESTIGATION

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE	
OnSite Wetlands	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 2-11	0	10/28/17

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\ONSITE WETLANDS.MXD MKB 10/28/2017

C:\03-Projects\Federal\Lower Darby\112G03943 - LDCA OU3 RI_FS - JCK\Documents\RI Report\Figure\ECOREGIONS.dwg MKB 10/28/17



45 Piedmont
- 45c Carolina Slate Belt
- 45e Northern Inner Piedmont
- 45f Northern Outer Piedmont
- 45g Triassic Basins

58 Northeastern Highlands
- 58h Reading Prong

60 Northern Appalachian Plateau
- 60a Glaciated Low Plateau
- 60b Northeastern Uplands

61 Erie/Ontario Drift And Lake Plains
- 61b Mosquito Creek/Pymatuning Lowlands
- 61c Low Lime Drift Plain

62 North Central Appalachians
- 62a Pocono High Plateau
- 62b Low Poconos
- 62c Glaciated Allegheny High Plateau
- 62d Unglaciated Allegheny High Plateau
- 62e Low Catskills

63 Middle Atlantic Coastal Plain
- 63a Delaware River Terraces and Uplands
- 63b Chesapeake-Pamlico Lowlands and Tidal Marshes
- 63c Swamps and Peatlands
- 63d Virginian Barrier Islands and Coastal Marshes
- 63e Mid-Atlantic Flatwoods
- 63f Delmarva Uplands

64 Northern Piedmont
- 64a Triassic Lowlands
- 64b Diabase and Conglomerate Uplands
- 64c Piedmont Uplands
- 64d Piedmont Limestone/Dolomite Lowlands

65 Southeastern Plains
- 65m Rolling Coastal Plain
- 65n Chesapeake Rolling Coastal Plain

66 Blue Ridge
- 66a Northern Igneous Ridges
- 66b Northern Sedimentary and Metasedimentary Ridges
- 66c New River Plateau
- 66d Southern Crystalline Ridges and Mountains
- 66e Southern Sedimentary Ridges
- 66f Limestone Valleys and Coves

67 Ridge and Valley
- 67a Northern Limestone/Dolomite Valleys
- 67b Northern Shale Valleys
- 67c Northern Sandstone Ridges
- 67d Northern Dissected Ridges
- 67e Anthracite Subregion
- 67f Southern Limestone/Dolomite Valleys and Low Rolling Hills
- 67g Southern Shale Valleys
- 67h Southern Sandstone Ridges
- 67i Southern Dissected Ridges and Knobs

69 Central Appalachians
- 69a Forested Hills and Mountains
- 69b Uplands and Valleys of Mixed Land Use
- 69c Greenbriar Karst
- 69d Dissected Appalachian Plateau
- 69e Cumberland Mountain Thrust Block

67 Ridge and Valley
- 67a Northern Limestone/Dolomite Valleys
- 67b Northern Shale Valleys
- 67c Northern Sandstone Ridges
- 67d Northern Dissected Ridges
- 67e Anthracite Subregion
- 67f Southern Limestone/Dolomite Valleys and Low Rolling Hills
- 67g Southern Shale Valleys
- 67h Southern Sandstone Ridges
- 67i Southern Dissected Ridges and Knobs

69 Central Appalachians
- 69a Forested Hills and Mountains
- 69b Uplands and Valleys of Mixed Land Use
- 69c Greenbriar Karst
- 69d Dissected Appalachian Plateau
- 69e Cumberland Mountain Thrust Block

70 Western Allegheny Plateau
- 70a Permian Hills
- 70b Monongahela Transition Zone
- 70c Pittsburgh Low Plateau

83 Eastern Great Lakes and Hudson Lowlands
- 83a Erie Lake Plain

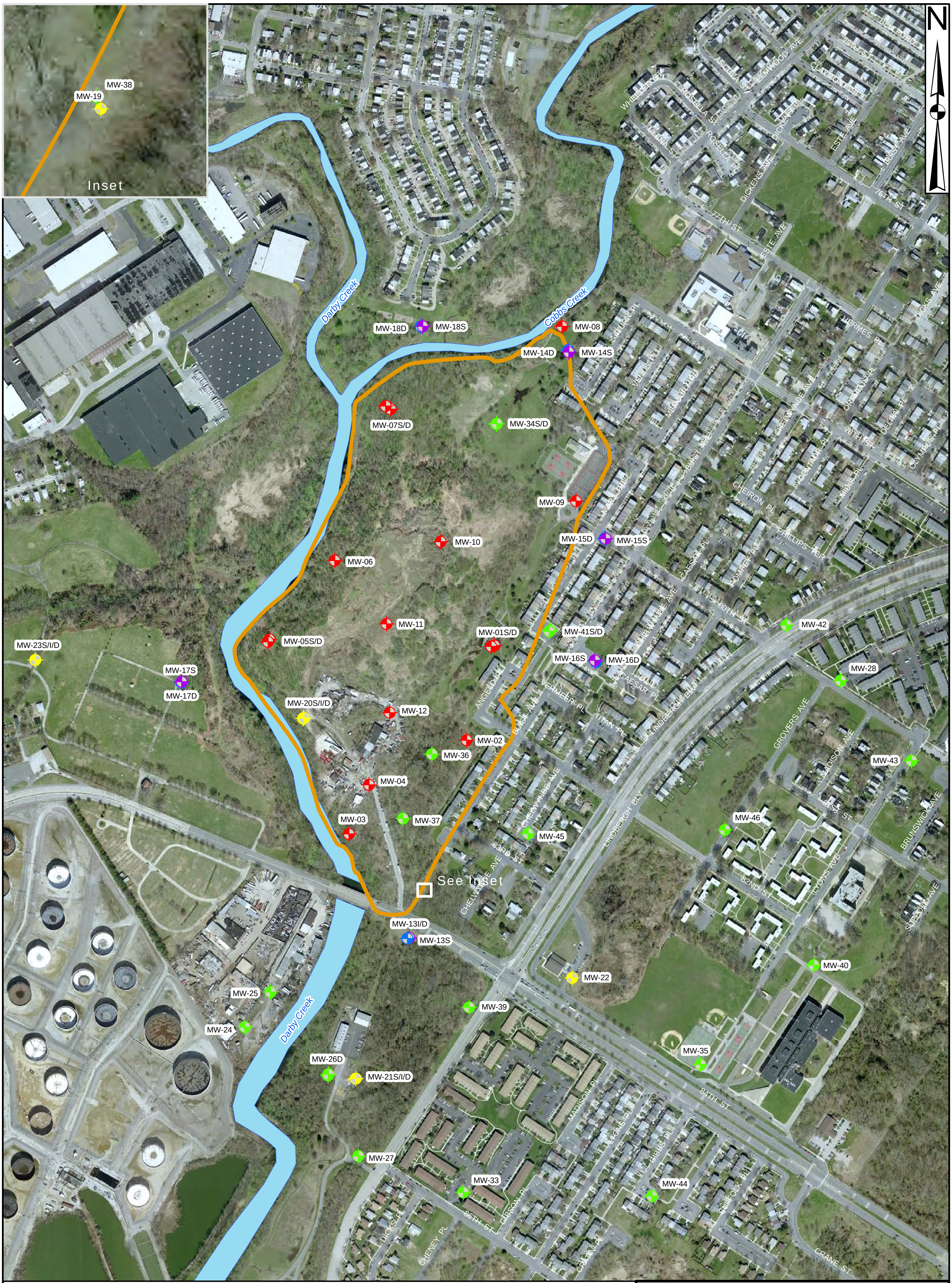
Level III Boundary
Level IV Boundary
State Boundary
County Boundary

TETRA TECH

LEVEL III AND IV
ECOREGIONS OF EPA REGION 3
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES,
PENNSYLVANIA

FILE	SCALE
ECOREGIONS.dwg	AS NOTED

FIGURE NUMBER	REV	DATE
FIGURE 2-12	0	10/28/17



Legend

- Shallow Monitoring Wells (Installed in 2003/2005/2006 during OU-1 RI)
- Shallow Monitoring Wells (Installed in 2011 during OU-1 RI)
- Deep Monitoring Wells (Installed in 2011 during OU-1 RI)
- Shallow Monitoring Wells (Installed in 2013 during OU-3 RI)
- Deep Monitoring Wells (Installed in 2013 during OU-3 RI)
- Historical Extent of Clearview Landfill

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

700 350 0 700
Feet

TETRA TECH

MONITORING WELL LOCATIONS
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES,
PENNSYLVANIA

FILE	SCALE
Monitoring Well Locations	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 3-1	0	03/07/17

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\MONITORING WELL LOCATIONS.MXD MKB 3/7/2017

- Historical Extent of Clearview Landfill
- Clearview Landfill
- City Park
- Eastwick Neighborhood
- County Boundary
- Stream Station

300 150 0 300 600
Feet

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

TETRA TECH

STREAM STATION LOCATIONS
SITE RECONNAISSANCE (JUNE 2012)
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
Stream Assessment Stations	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 3-2	0	03/02/17

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\STREAM ASSESSMENT STATIONS.MXD MKB 3/2/2017

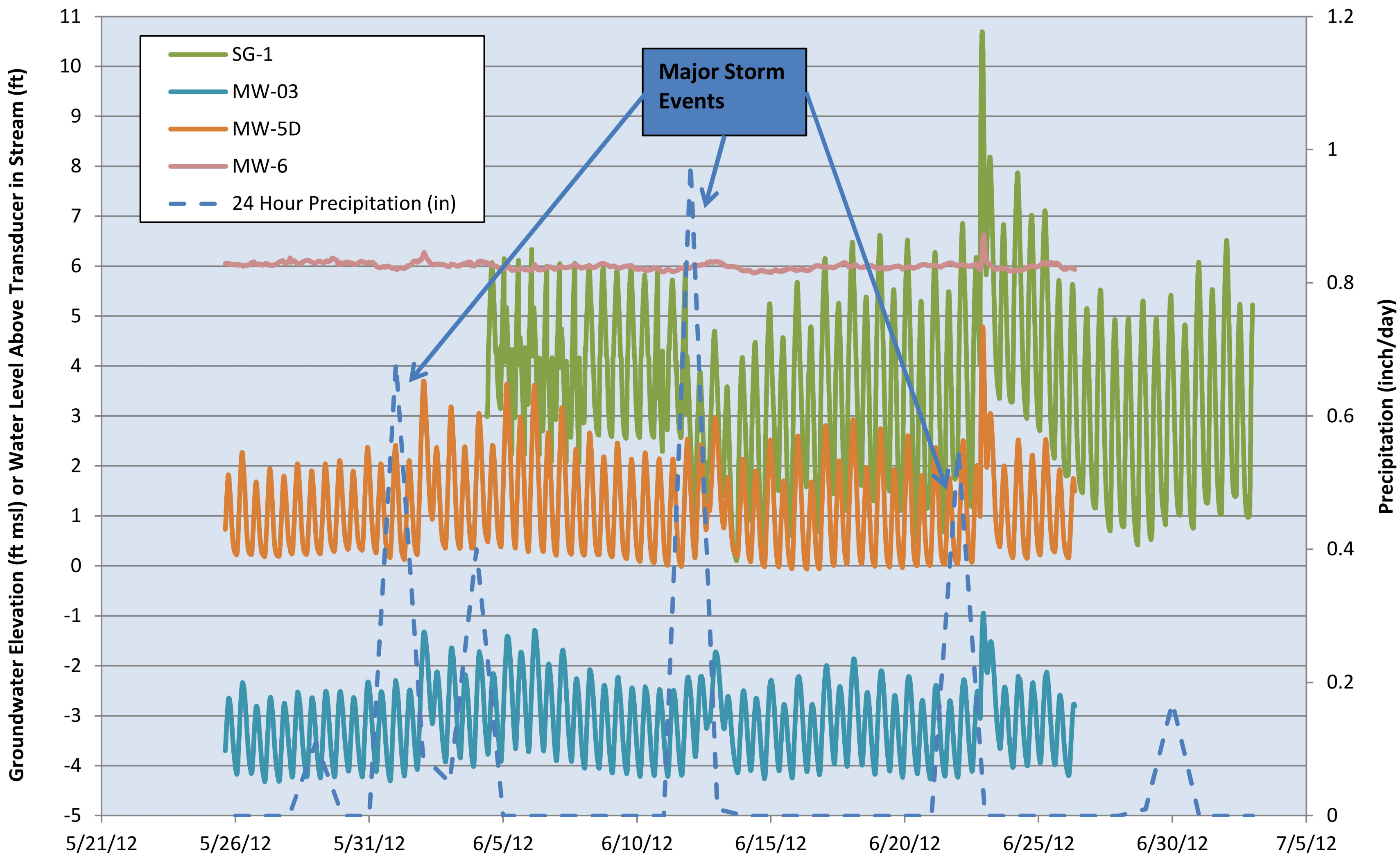
This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

TETRA TECH

TRANSDUCER LOCATIONS
OU-3 SITE RECONAISSANCE
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
Transducer Locations	PER SCALE BAR

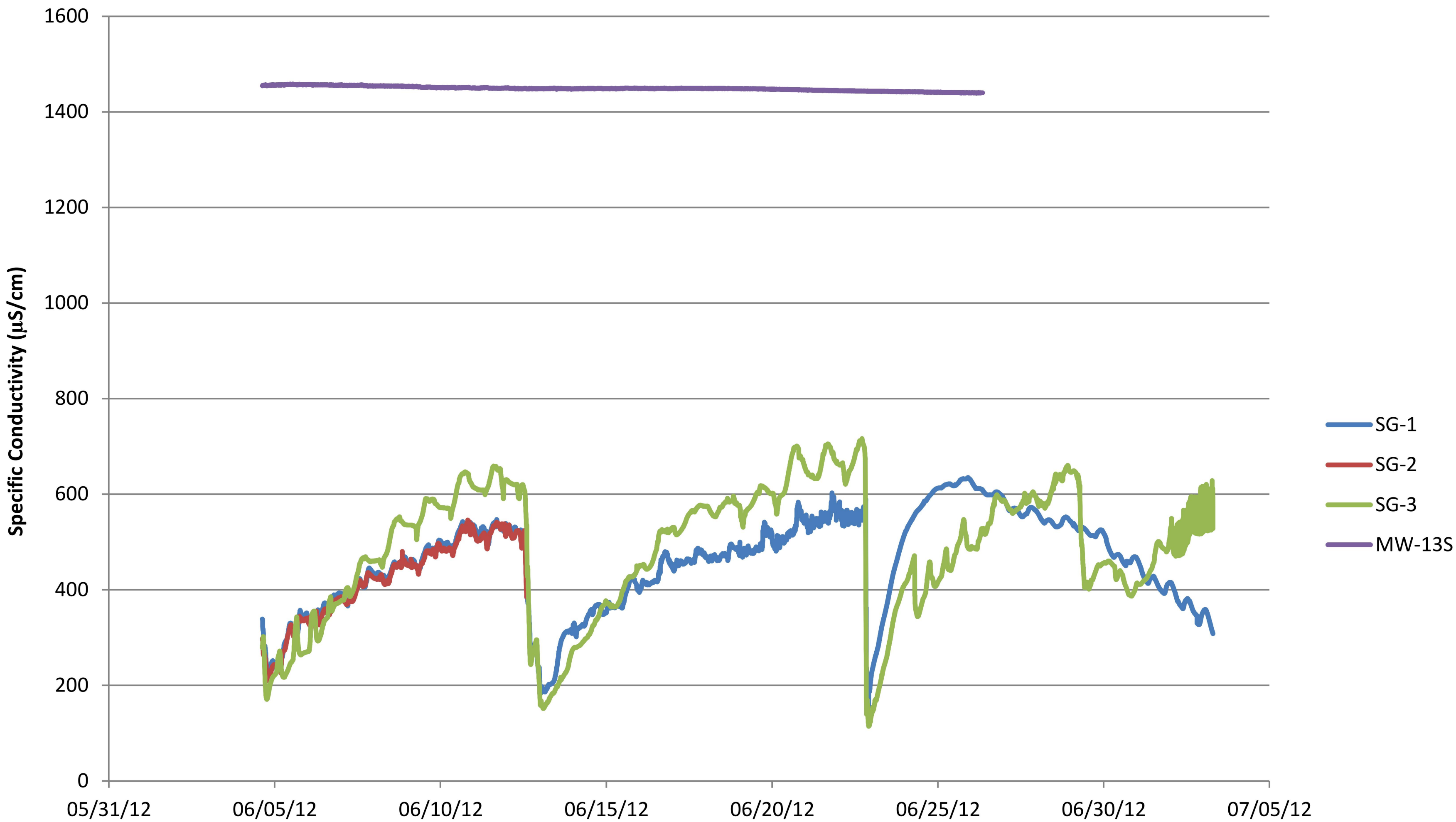
FIGURE NUMBER	REV	DATE
FIGURE 3-3	0	03/08/17



TETRA TECH

MEASURED WATER LEVELS IN SELECT MONITORING WELLS AND A STREAM GAUGE DURING MAJOR STORM EVENTS
LOWER DARBY CREEK AREA (LDCA)
SITE OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

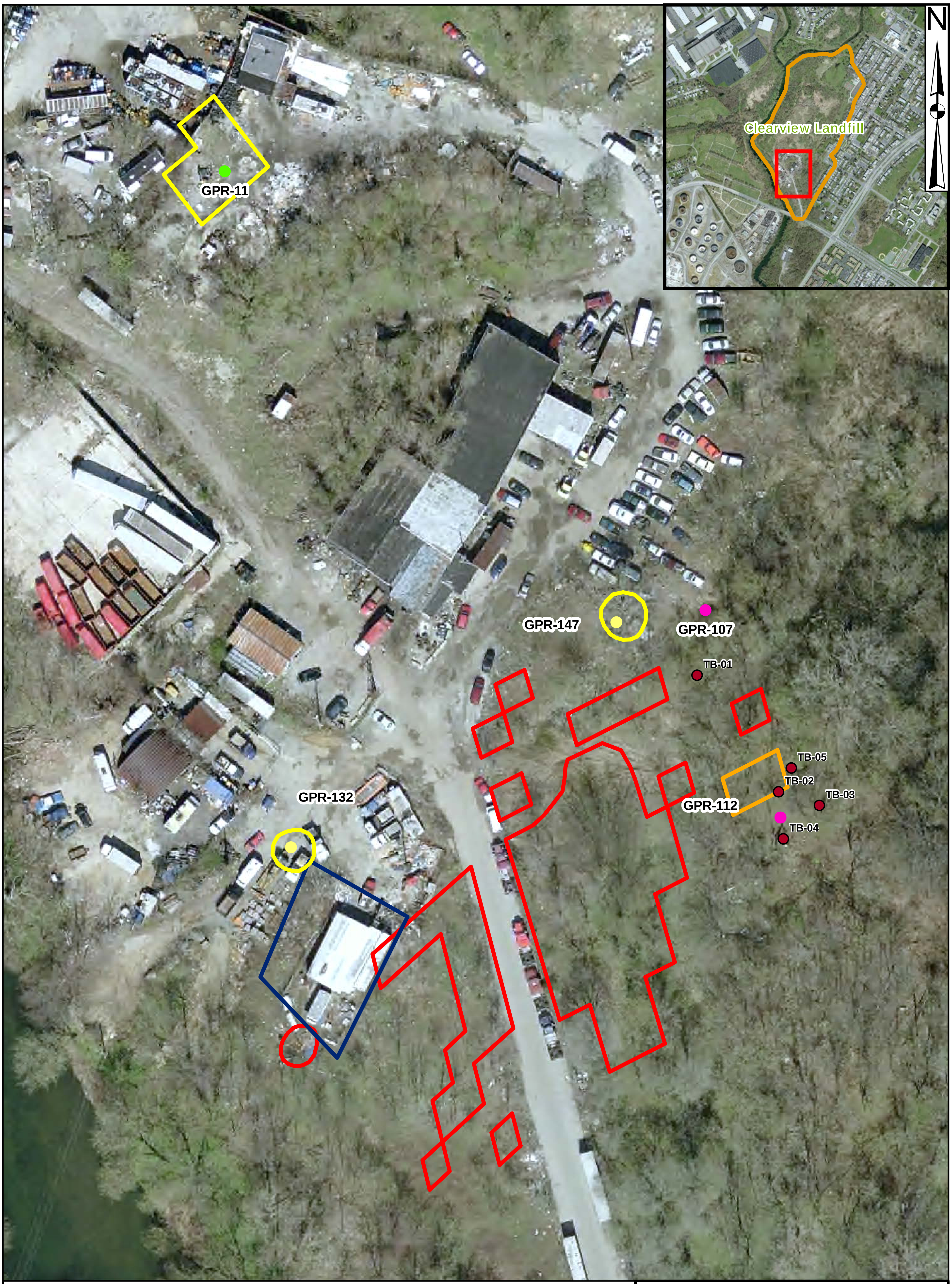
SCALE	AS NOTED
FILE	DECISION LOGIC DIAGRAMS
REV 0	DATE 3/7/17
FIGURE NUMBER	**FIGURE 3-4**



TETRA TECH

SPECIFIC CONDUCTIVITY MEASURED IN STREAM GAUGES AND MONITORING WELL MW-13S
LOWER DARBY CREEK AREA (LDCA)
SITE OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	DECISION LOGIC DIAGRAMS
REV 0	DATE 3/7/17
FIGURE NUMBER	FIGURE 3-5



Legend

- Area with PCBs > 25 mg/kg Addressed under Removal Action (Top 12" Surface Soil was Excavated)
- Areas with PCBs > 50 mg/kg To be Addressed under Remedial Action (estimated extent)
- Areas with PCBs > 50 mg/kg Addressed under Removal Action (approximate extent)
- Area To be Investigated under Remedial Action (Currently Inaccessible)
- **Removal Action "Hot" Sampling Locations (VOC/SVOC/Pesticide)**
- **Principal Threat Waste Sampling Locations**
- **MiHPT® Sampling Locations**

60 30 0 60 120
Feet

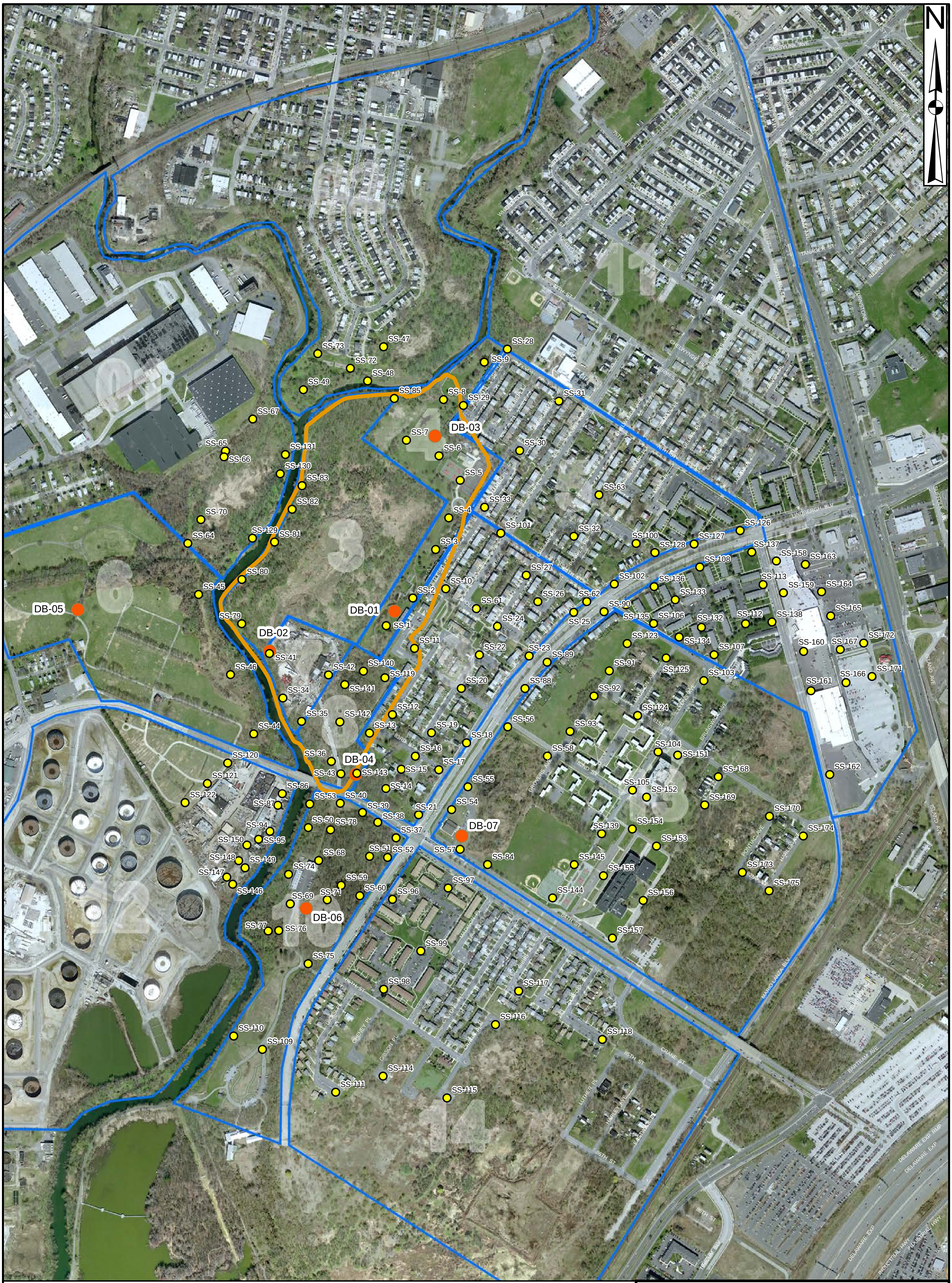
This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

TETRA TECH

FORMER TIME CRITICAL REMOVAL ACTION (TCRA)/ DIRECT PUSH SENSING TECHNOLOGY TESTING AREA

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE	
Direct Push Sensing Technology	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 3-6	0	03/02/17



C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\TEMPORARY BORING LOCATIONS.MXD MKB 3/2/2017

Legend

- Shallow Boring Locations
- Deep Boring Locations
- Historical Extent of Clearview Landfill
- Decision Units

700 350 0 700 1,400

Feet

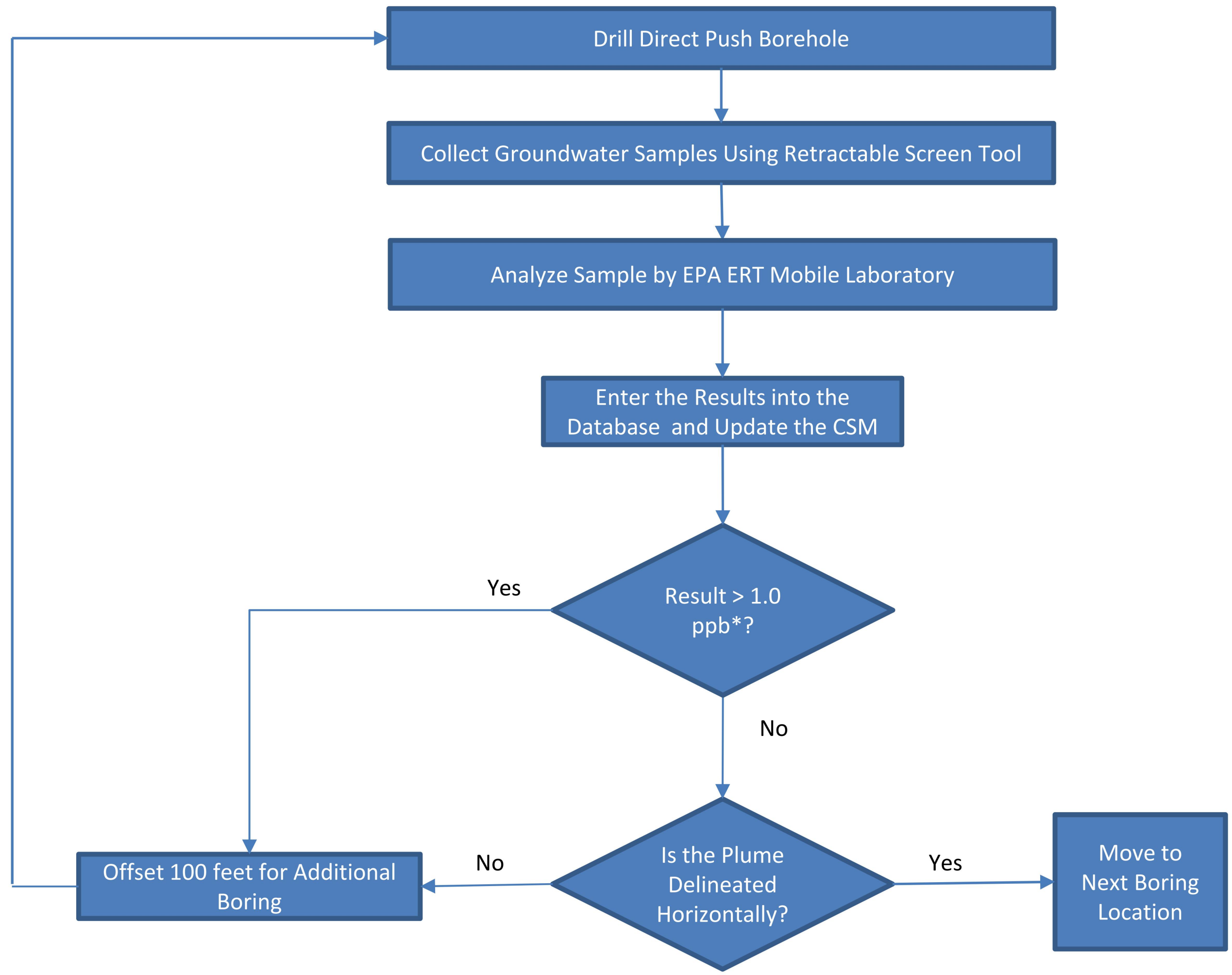
This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

TETRA TECH

BORING LOCATIONS
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE	
Temporary Boring Locations	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 3-7	0	03/02/17

ppb: Parts Per Billion

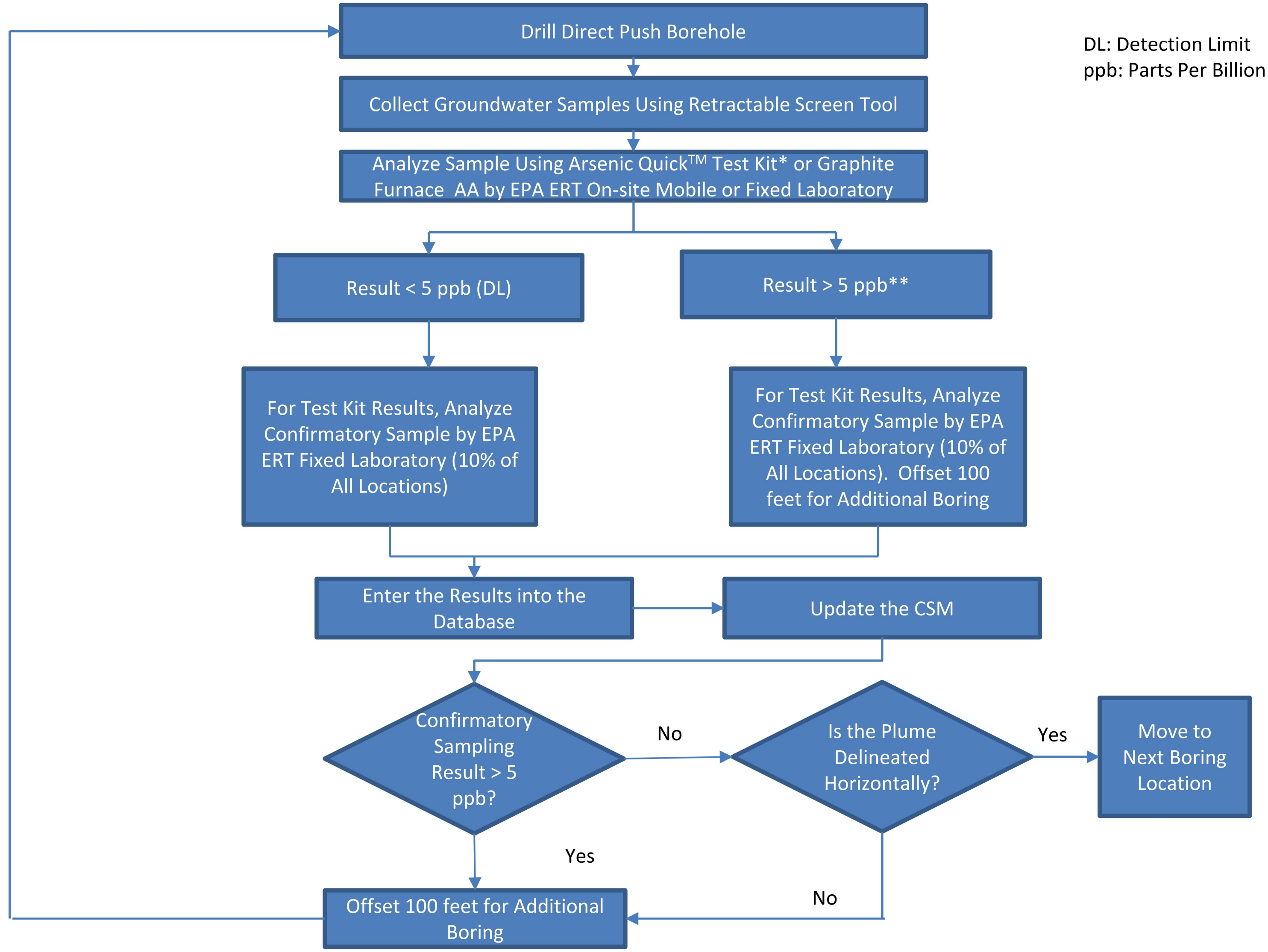


* Detection Limit of an Analytical Method

TETRA TECH

DECISION LOGIC DIAGRAM FOR
1,4-DIOXANE IN SHALLOW AQUIFER
LOWER DARBY CREEK AREA (LDCA)
SITE OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	DECISION LOGIC DIAGRAMS
REV	0
DATE	3/7/17
FIGURE NUMBER	**FIGURE 3-8**



* Approved by EPA Environmental Technology Verification Program.

** EPA Region 3 BTAG Freshwater Screening Benchmark (7/2006)

TETRA TECH

DECISION LOGIC DIAGRAM FOR ARSENIC IN SHALLOW AQUIFER

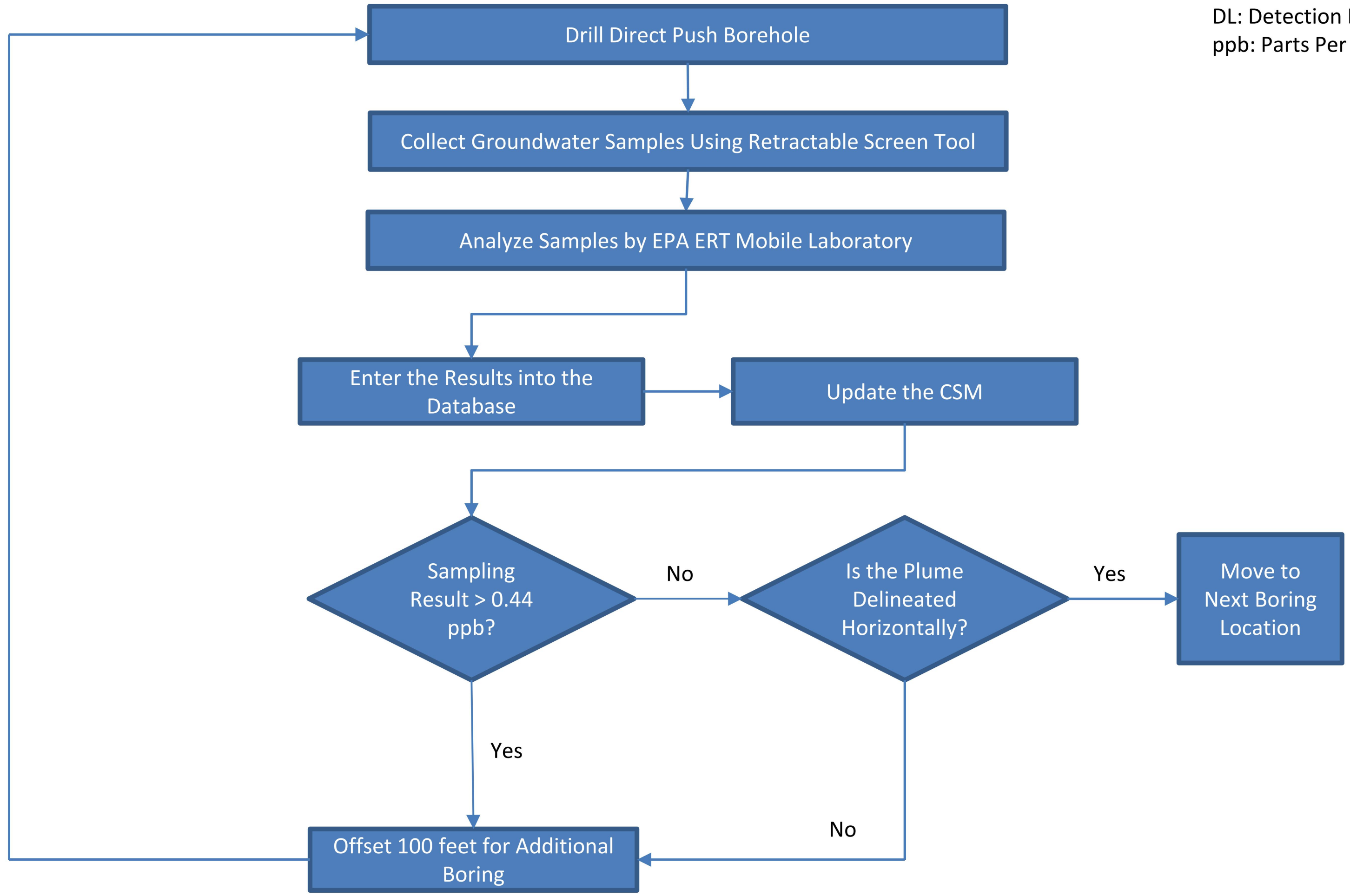
LOWER DARBY CREEK AREA (LDCA)

SITE OPERABLE UNIT 3 (OU-3)

PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	DECISION LOGIC DIAGRAMS
REV	0
DATE	3/7/17
FIGURE NUMBER	**FIGURE 3-9**

DL: Detection Limit
ppb: Parts Per Billion



* EPA Region 3 Screening Level for Tapwater (November 2012)

TETRA TECH

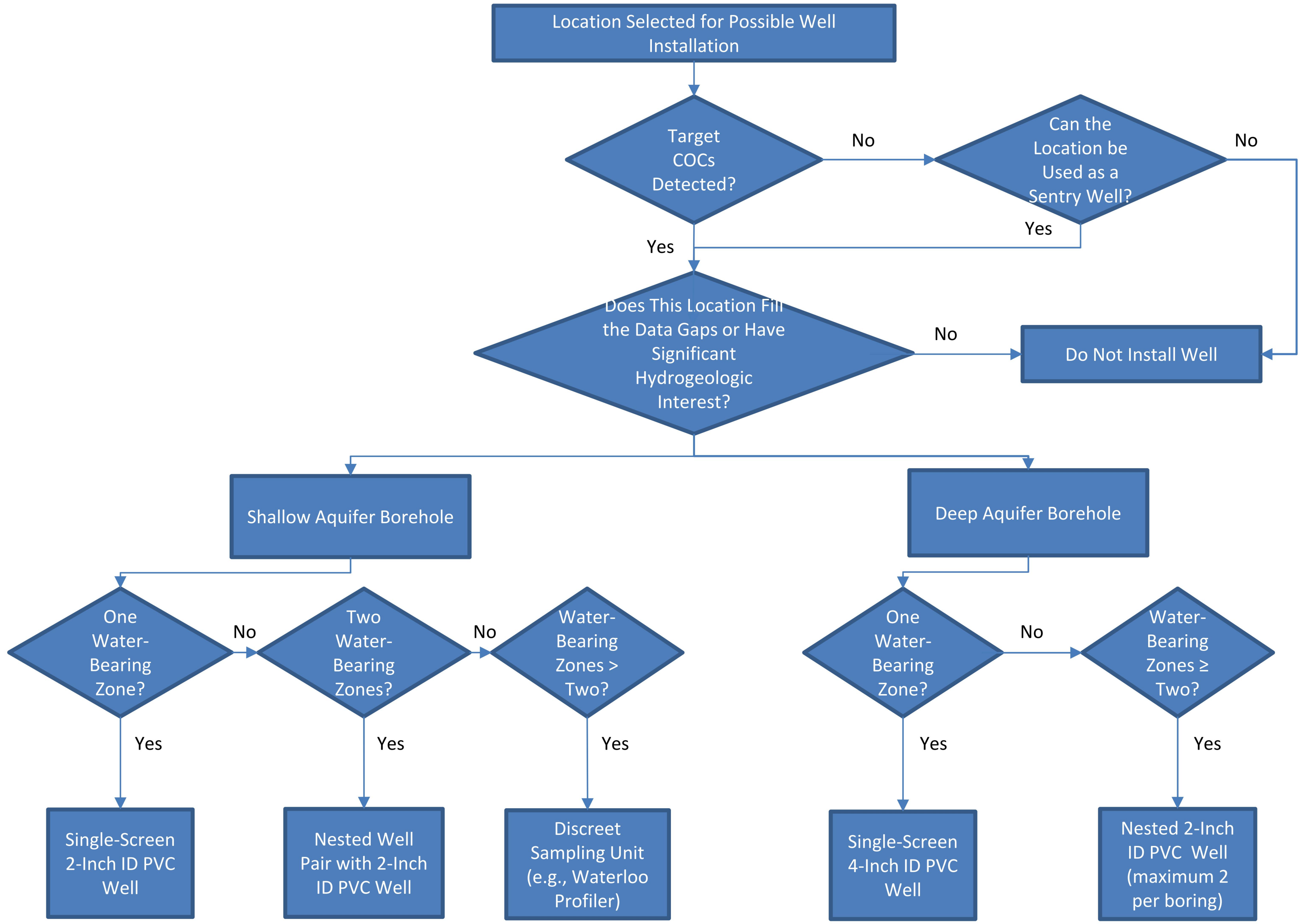
DECISION LOGIC DIAGRAM FOR TRICHLOROETHENE (TCE) IN SHALLOW AQUIFER
LOWER DARBY CREEK AREA (LDCA)
SITE OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

SCALE
AS NOTED

FILE
DECISION LOGIC DIAGRAMS

REV 0
DATE 3/7/17

FIGURE NUMBER
FIGURE 3-10

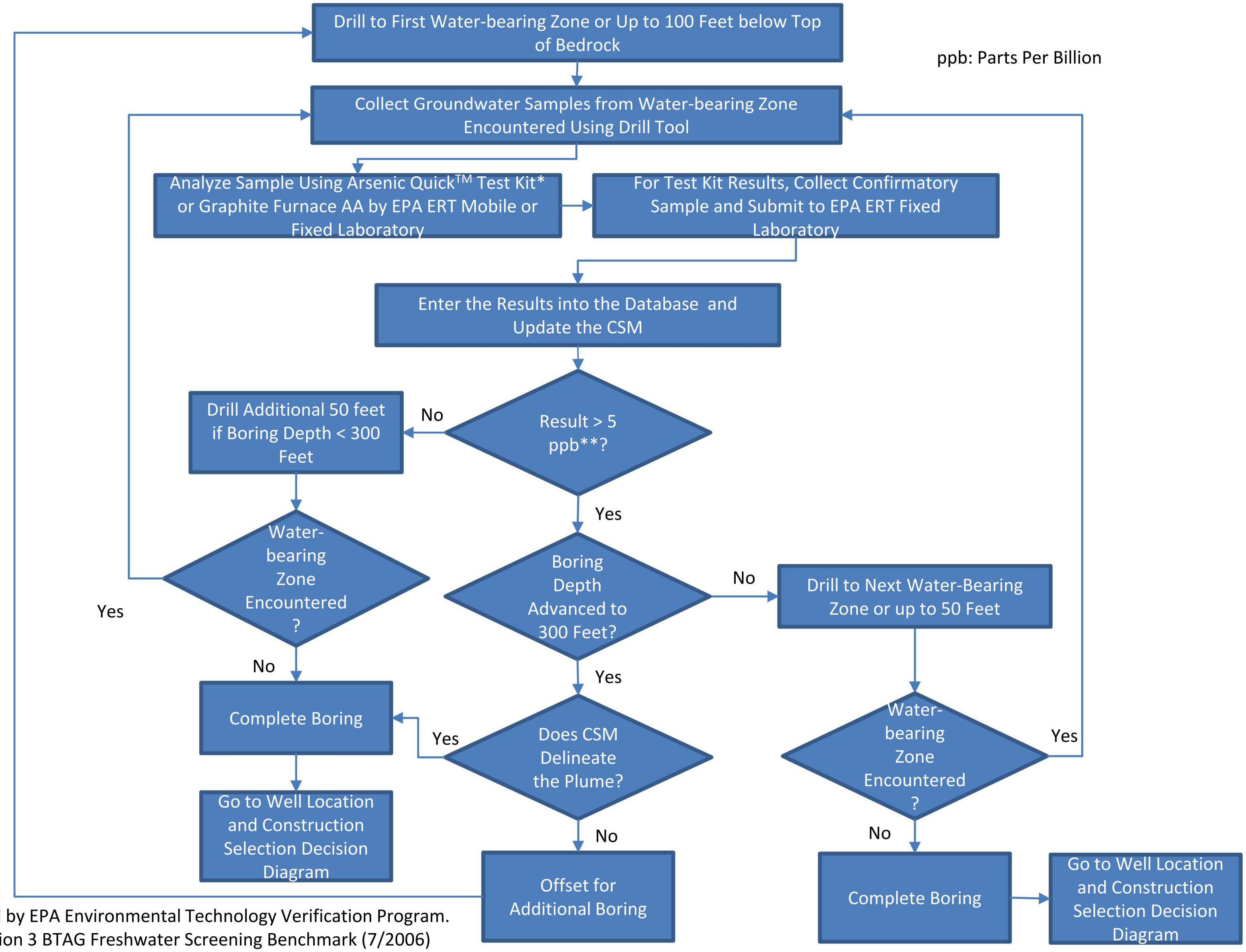


TETRA TECH

DECISION LOGIC DIAGRAM FOR
1,4-DIOXANE IN DEEP AQUIFER
LOWER DARBY CREEK AREA (LDCA)
SITE OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	DECISION LOGIC DIAGRAMS
REV 0	DATE 3/7/17
FIGURE NUMBER	**FIGURE 3-11**

C:\03-Projects\Federal\Lower Darby\112G03943 - LDCA OU3 RI_FS - JCK\Documents\RI Report\Figure\DECISION LOGIC DIAGRAMS.dwg MKB 3/7/17



* Approved by EPA Environmental Technology Verification Program.

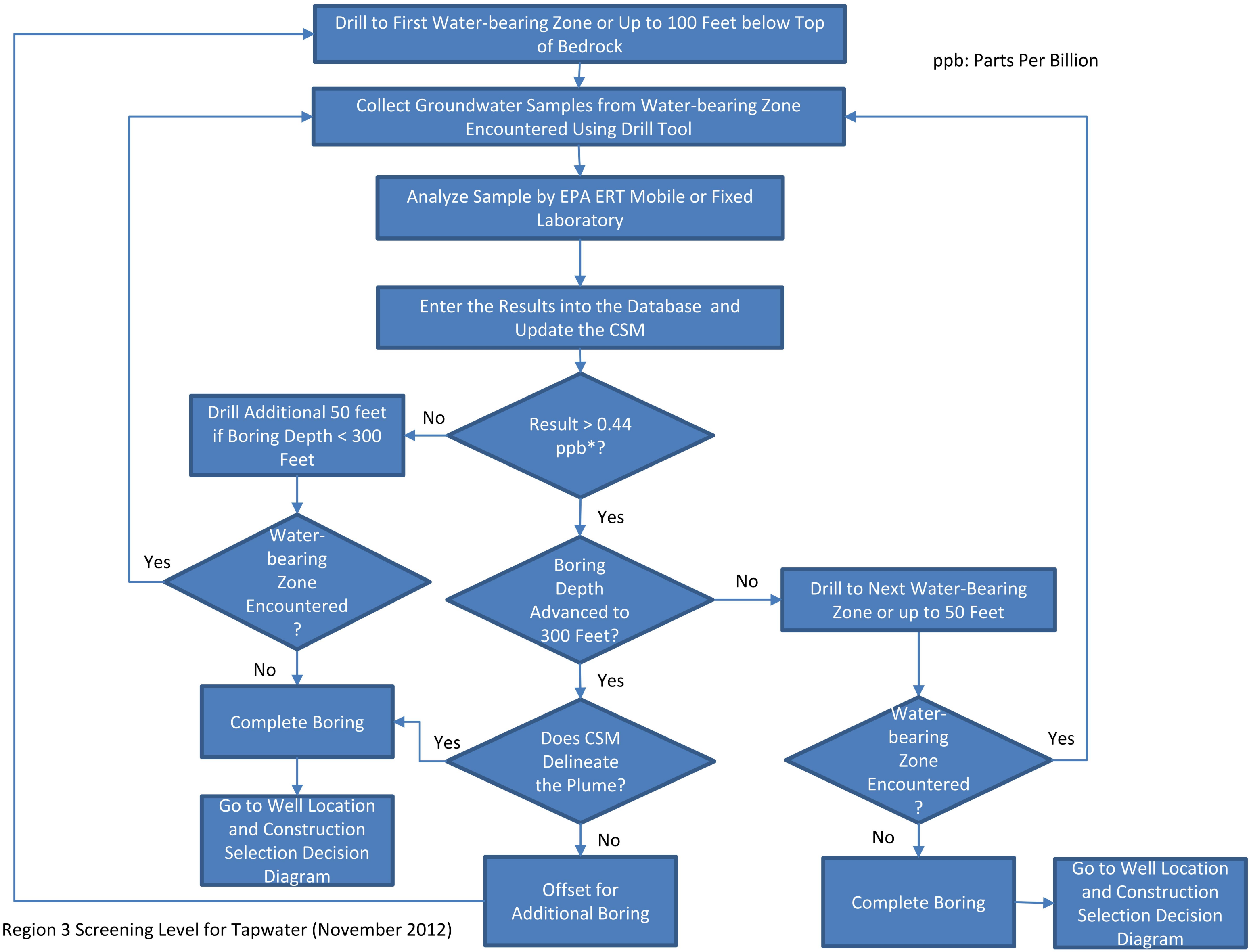
** EPA Region 3 BTAG Freshwater Screening Benchmark (7/2006)

TETRA TECH

DECISION LOGIC DIAGRAM FOR ARSENIC IN DEEP AQUIFER
LOWER DARBY CREEK AREA (LDCA)
SITE OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	DECISION LOGIC DIAGRAMS
REV 0	DATE 3/7/17
FIGURE NUMBER	**FIGURE 3-12**

C:\03-Projects\Federal\Lower Darby\112G03943 - LDCA OU3 RI_FS - JCK\Documents\RI Report\Figure\DECISION LOGIC DIAGRAMS.dwg MKB 3/7/17

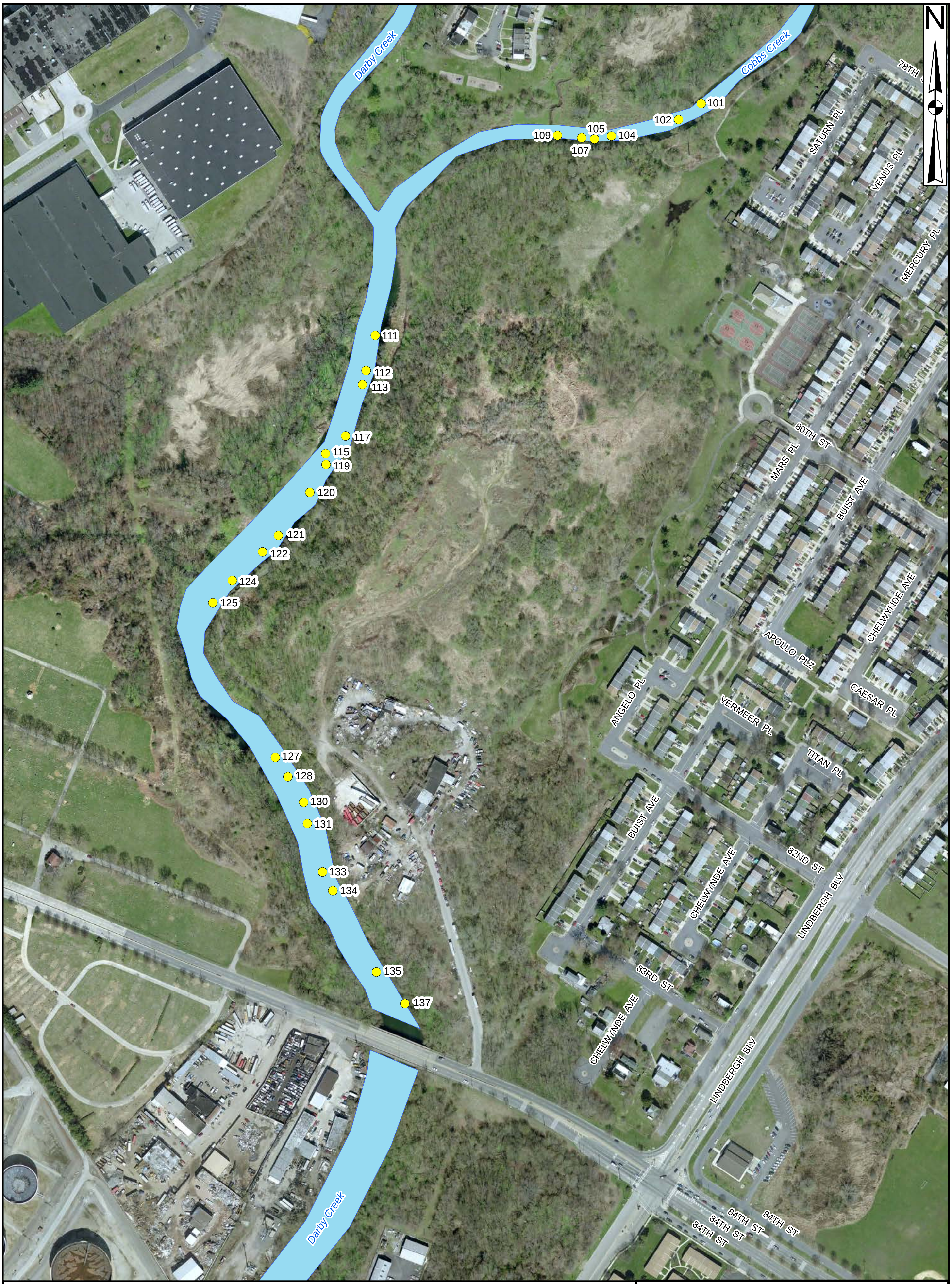


* EPA Region 3 Screening Level for Tapwater (November 2012)

TETRA TECH

DECISION LOGIC DIAGRAM FOR
TRICHLOROETHENE (TCE) IN DEEP AQUIFER
LOWER DARBY CREEK AREA (LDCA)
SITE OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	DECISION LOGIC DIAGRAMS
REV 0	DATE 3/7/17
FIGURE NUMBER	**FIGURE 3-13**



C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\REMOTE SENSING TECHNOLGY SURVEY STATIONS.MXD MKB 3/8/2017

Legend

Remote Sensing Technology Survey Stations (March 2013)

300 150 0 300 600

Feet

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

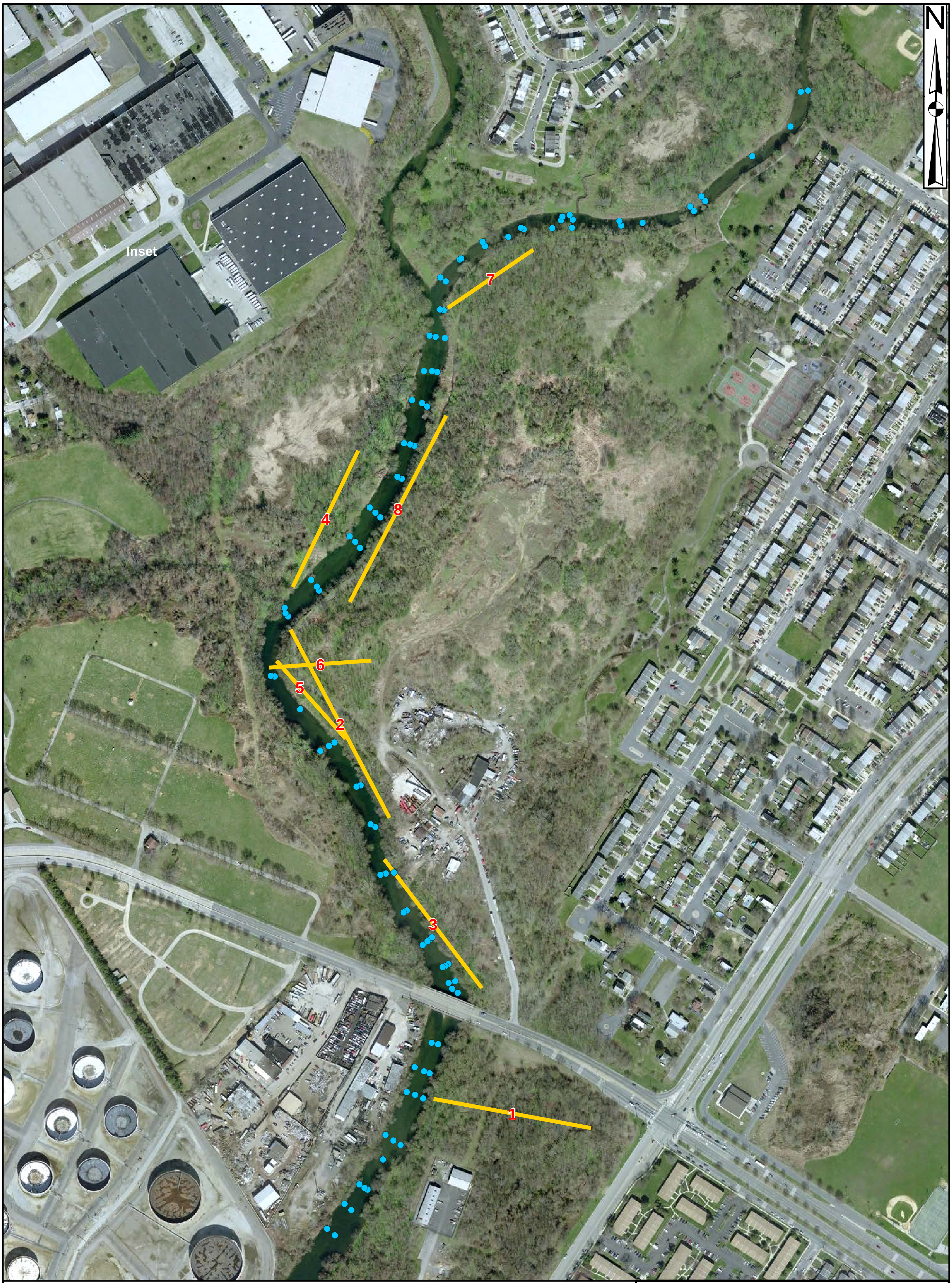
TETRA TECH

REMOTE SENSING TECHNOLOGY SURVEY LOCATIONS

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
Remote Sensing Technolgy Survey Stations	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 3-14	0	03/08/17



350 175 0 350 700

Feet

Legend

- Porewater Specific Conductance Measurement
- DC Resistivity Lines

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

TETRA TECH

SURFICIAL GEOPHYSICS (MARCH 2013) AND PORE WATER SPECIFIC CONDUCTANCE MEASUREMENTS (JULY/AUGUST 2013) LOCATIONS

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE	
Porewater Sampling Locations	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 3-15	0	03/06/17

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\POREWATER SAMPLING LOCATIONS.MXD MKB 3/6/2017

C:\03-Projects\Federal\Lower Darby\112G03943 - LDCA OU3 RI_FS - JCK\Drawings\112G03943GM01.dwg MKB 10/26/17

Legend

July-August Cond Maximum SC (µs/cm)

- 306 - 645
- 645 - 1250
- 1250 - 1962
- 1962 - 8010
- Monitoring Well

Note:
Results adapted from USGS Streambed Pore Water Conductance Assessment, August 2013.

0 700 1,400
APPROXIMATE SCALE IN FEET

TETRA TECH

PORE WATER CONDUCTANCE ASSESSMENT
MAXIMUM RESULTS
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
112G03943GM01.dwg	AS NOTED

FIGURE NUMBER	REV	DATE
FIGURE 3-16	0	10/26/17

Legend

July-August Cond Maximum SC (µs/cm)

- 189 - 645
- 645 - 1250
- 1250 - 1962
- 1962 - 8010
- Monitoring Well

Note:
Results adapted from USGS Streambed Pore Water Conductance Assessment, August 2013.

0 700 1,400
APPROXIMATE SCALE IN FEET

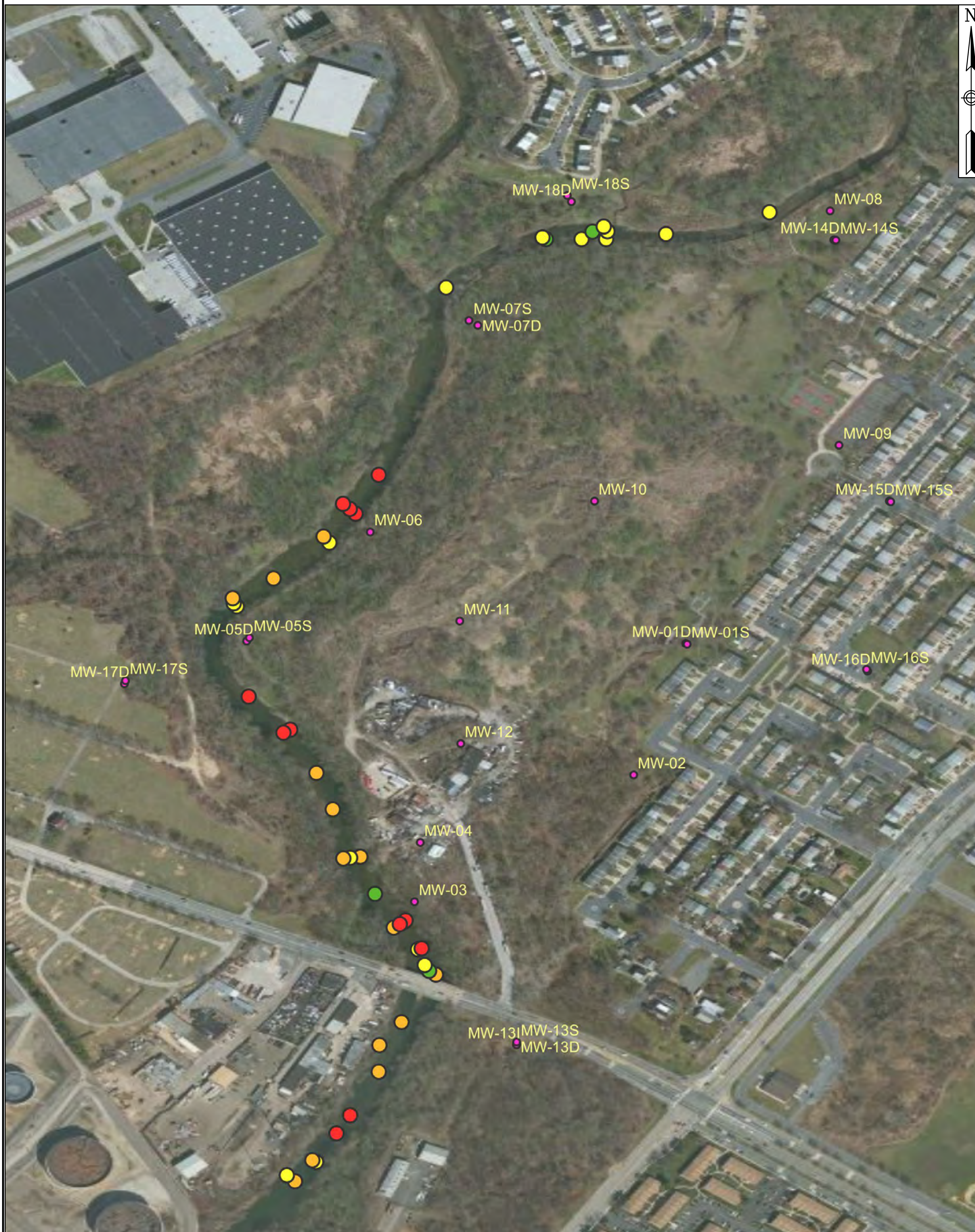
TETRA TECH

PORE WATER CONDUCTANCE ASSESSMENT
2-FOOT DEPTH RESULTS
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
112G03943GM01.dwg	AS NOTED

FIGURE NUMBER	REV	DATE
FIGURE 3–17	0	10/26/17

C:\03-Projects\Federal\Lower Darby\112G03943 - LDCA OU3 RI_FS - JCK\Drawings\112G03943GM01.dwg MKB 10/26/17



Legend

July-August Cond Maximum SC (µs/cm)

- 189 - 645
- 645 - 1250
- 1250 - 1962
- 1962 - 8010
- Monitoring Well

Note:
Results adapted from USGS Streambed Pore Water Conductance Assessment, August 2013.

0 700 1,400

APPROXIMATE SCALE IN FEET

TETRA TECH

PORE WATER CONDUCTANCE ASSESSMENT
4-FOOT DEPTH RESULTS
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
112G03943GM01.dwg	AS NOTED

FIGURE NUMBER	REV	DATE
FIGURE 3–18	0	10/26/17

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\POREWATER SAMPLING LOCATIONS 2013-2016.MXD MKB 10/16/2017

Legend

Pore Water Sampling Location

- May 2103
- May 2013 and February 2016
- September 2013
- September 2013 and February 2016

300 150 0 300 600

Feet

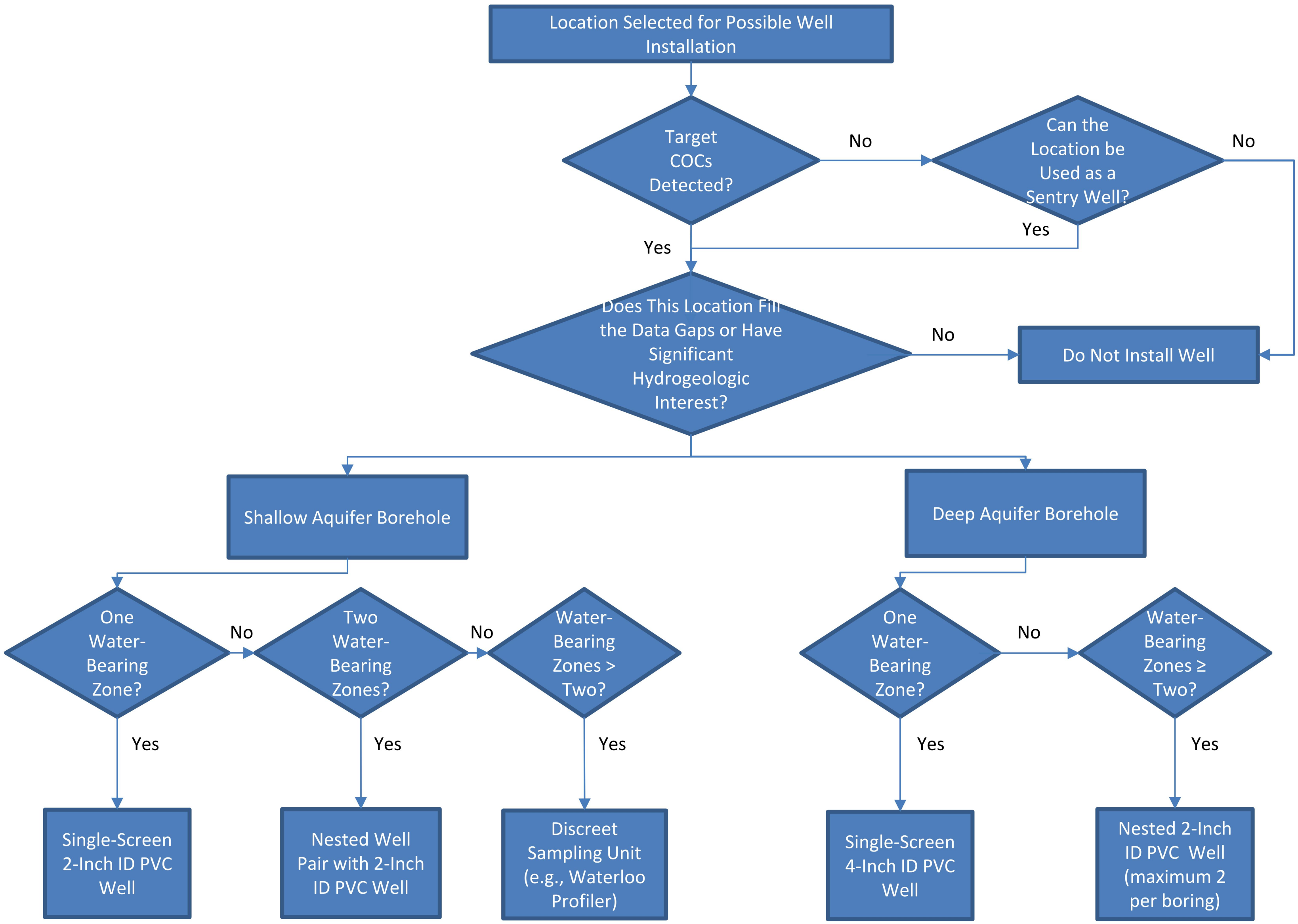
This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

TETRA TECH

PORE WATER SAMPLING LOCATIONS
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES,
PENNSYLVANIA

FILE	SCALE	
Porewater Sampling Locations 2013-2016	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 3-19	0	10/16/17

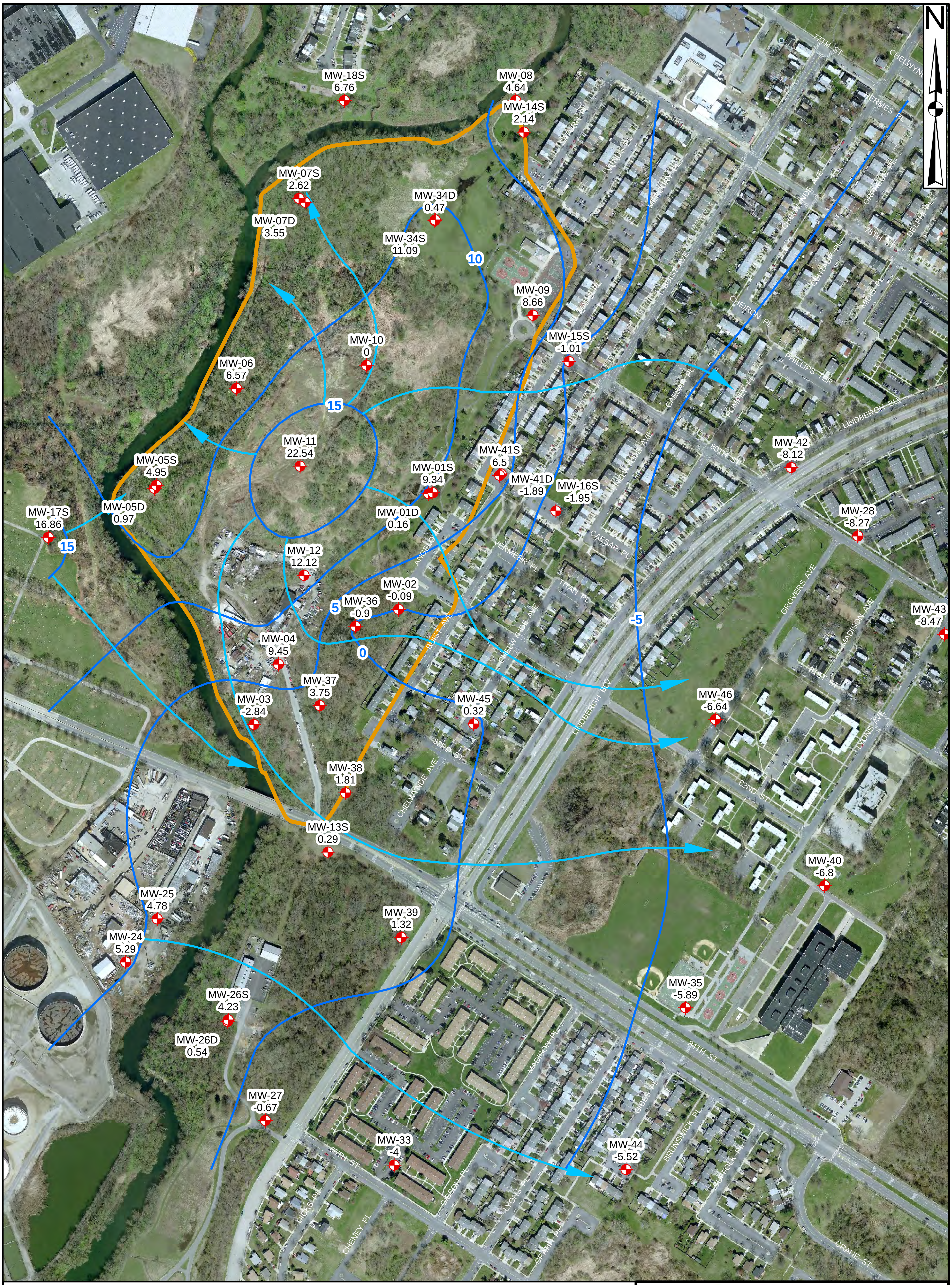
C:\03-Projects\Federal\Lower Darby\112G03943 - LDCA OU3 RI_FS - JCK\Documents\RI Report\Figure\DECISION DIAGRAMS.dwg MKB 10/17/17



TETRA TECH

DECISION LOGIC DIAGRAM FOR WELL CONSTRUCTION
LOWER DARBY CREEK AREA (LDCA)
SITE OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	DECISION DIAGRAMS
REV 0	DATE 10/17/17
FIGURE NUMBER	**FIGURE 3-20**



G:\CLEAN_9008\CUTLER\MXD\GW CONTOUR MAP SHALLOW 201403.MXD MKB 2/14/2019

Legend

- Shallow Groundwater Well
- Groundwater Flow Direction
- -5 Shallow Aquifer Groundwater Contours
- Historical Extent of Clearview Landfill
- -1.01 Shallow Groundwater Elevation (ft msl), Measured in March 2014

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

500 250 0 500
Feet

TETRA TECH

SHALLOW (OVERBURDEN) GROUNDWATER CONTOUR MAP
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
GW Contour Map Shallow 201403	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 3-21	0	02/14/19

Legend

Shallow Groundwater Well

Groundwater Flow Direction

-4 Shallow Aquifer Groundwater Contours

Historical Extent of Clearview Landfill

1.64 Shallow Groundwater Elevation (ft msl), Measured in December 2014

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

500 250 0 500 1,000

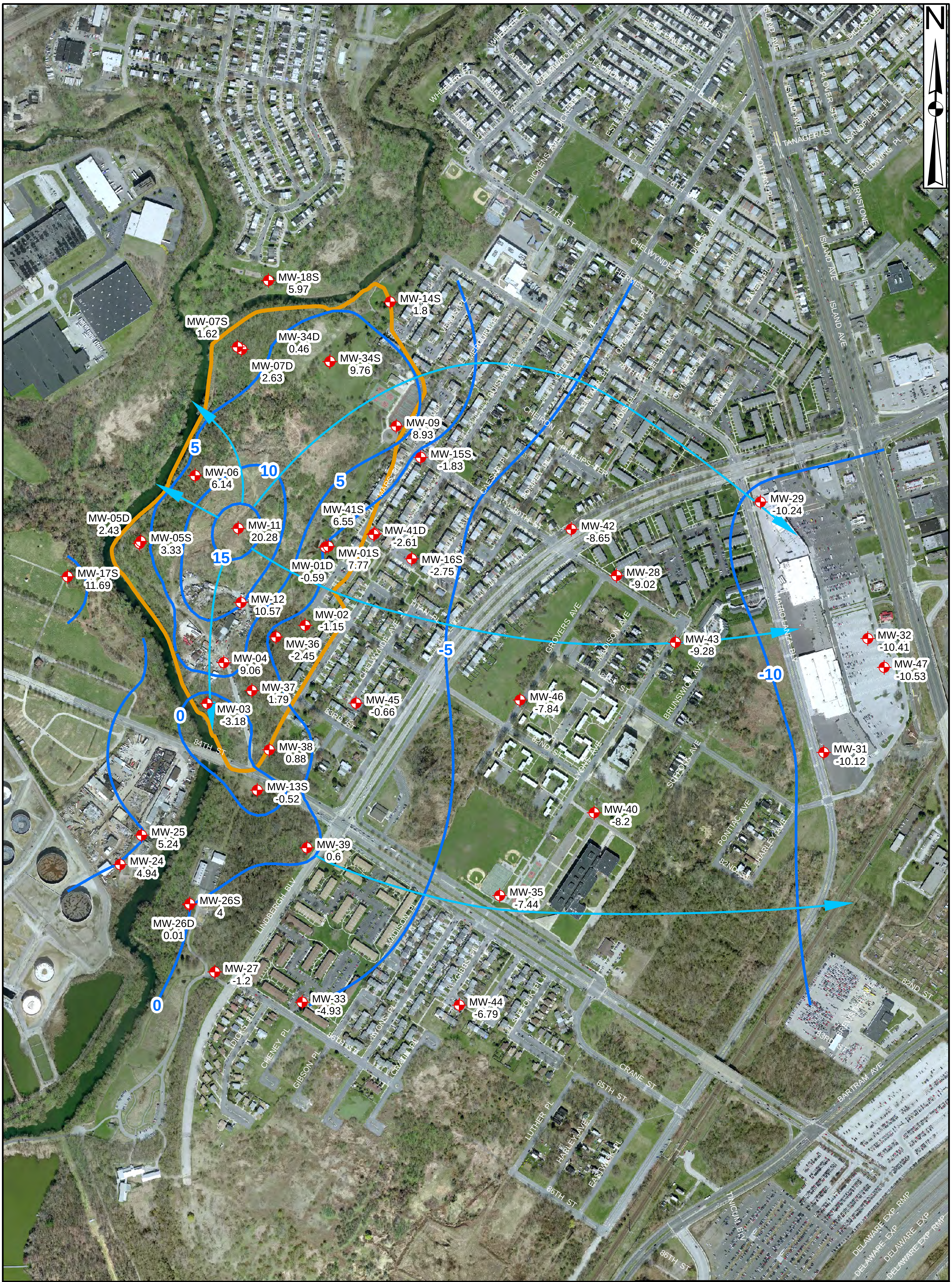
Feet

TETRA TECH

SHALLOW (OVERBURDEN) GROUNDWATER CONTOUR MAP
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
GW Contour Map Shallow 201412	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 3-22	0	02/14/19



C:\ALL_PROJECTS\03-PROJECTS\FEDERAL\DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\GW CONTOUR MAP SHALLOW 201507.MXD MKB 2/12/2019

Legend

- Shallow Groundwater Well
- Groundwater Flow Direction
- Historical Extent of Clearview Landfill
- -4 Shallow Aquifer Groundwater Contours
- 2.43 Shallow Groundwater Elevation (ft msl), Measured in July 2015

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

600 300 0 600 1,200
Feet

TETRA TECH

SHALLOW (OVERBURDEN) GROUNDWATER CONTOUR MAP
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
GW Contour Map Shallow 201507	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 3-23	0	02/12/19

Legend

- Monitoring Wells
- Historical Extent of Clearview Landfill
- Groundwater Flow Direction
- Groundwater Equipotential Lines
- 4.5 Shallow Groundwater Elevation (ft msl), Measured in April 2016

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

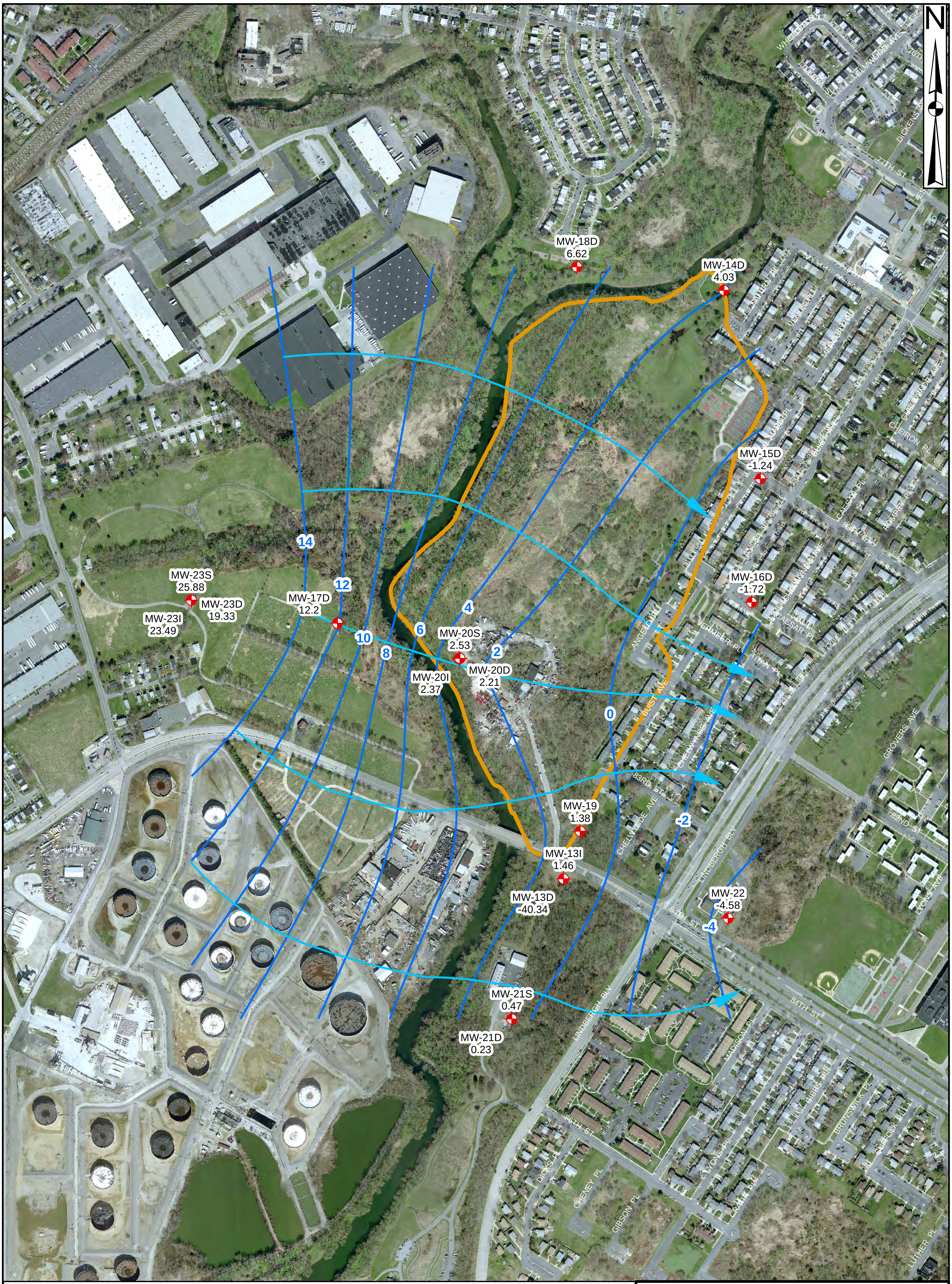
300 150 0 300 600
Feet

TETRA TECH

GROUNDWATER FLOW NET
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
GW Flow Net	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 3-24	0	02/12/19



C:\ALL_PROJECTS\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\GW CONTOUR MAP DEEP 201403.MXD MKB 2/14/2019

Legend

- Deep Groundwater Well
- Groundwater Flow Direction
- -4 Deep Aquifer Groundwater Contours
- Historical Extent of Clearview Landfill
- 4.03 Deep Groundwater Elevation (ft msl), Measured in March 2014

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

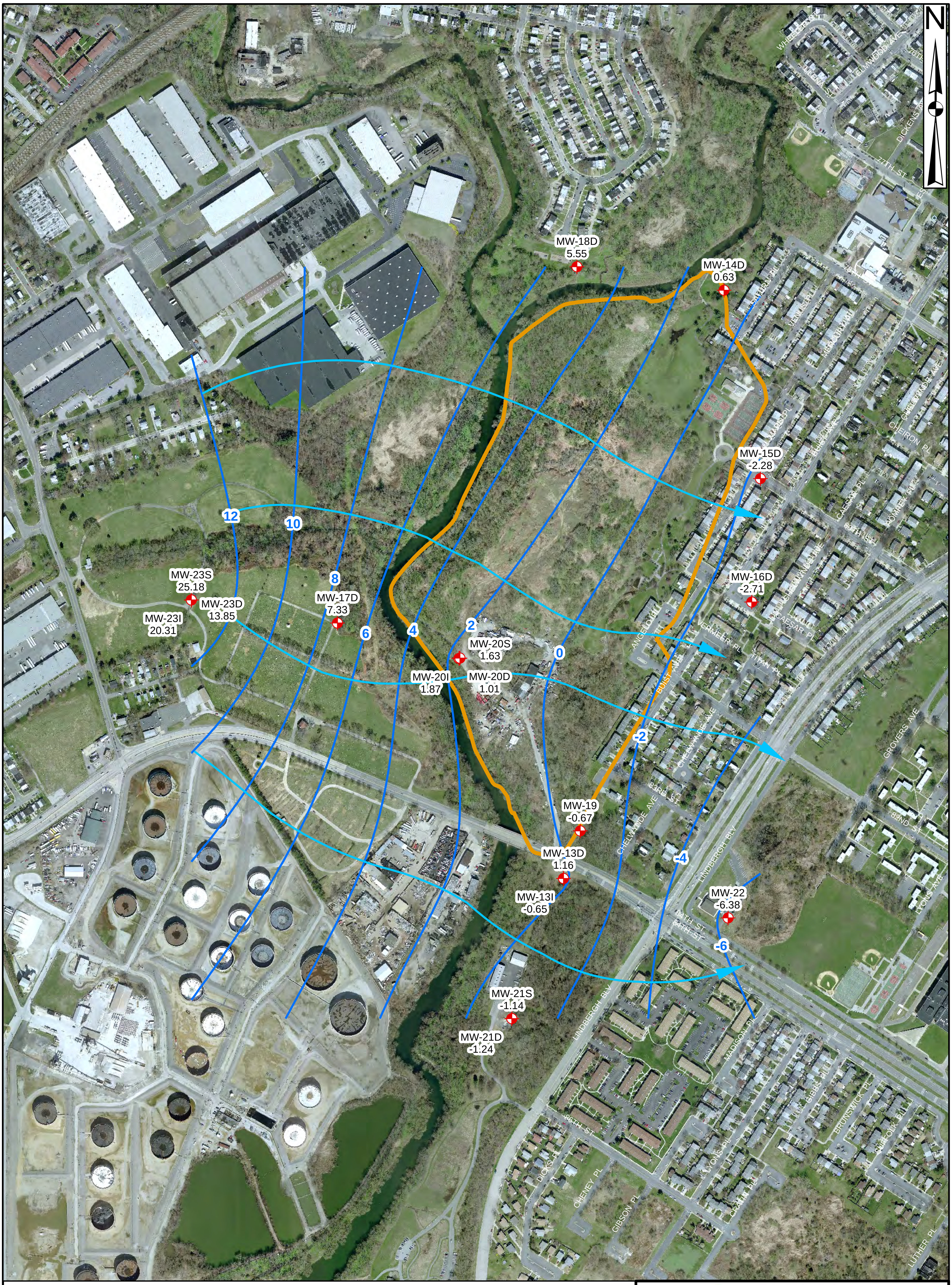
500 250 0 500 1,000
Feet

TETRA TECH

DEEP (BEDROCK) GROUNDWATER CONTOUR MAP
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
GW Contour Map Deep 201403	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 3-25	0	02/14/19



C:\ALL_PROJECTS\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\GW CONTOUR MAP DEEP 201412.MXD MKB 2/14/2019

Legend

- Deep Groundwater Well
- Groundwater Flow Direction
- -4 Groundwater Flow Direction
- Historical Extent of Clearview Landfill
- 1.01 Deep Groundwater Elevation (ft msl), Measured in December 2014

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

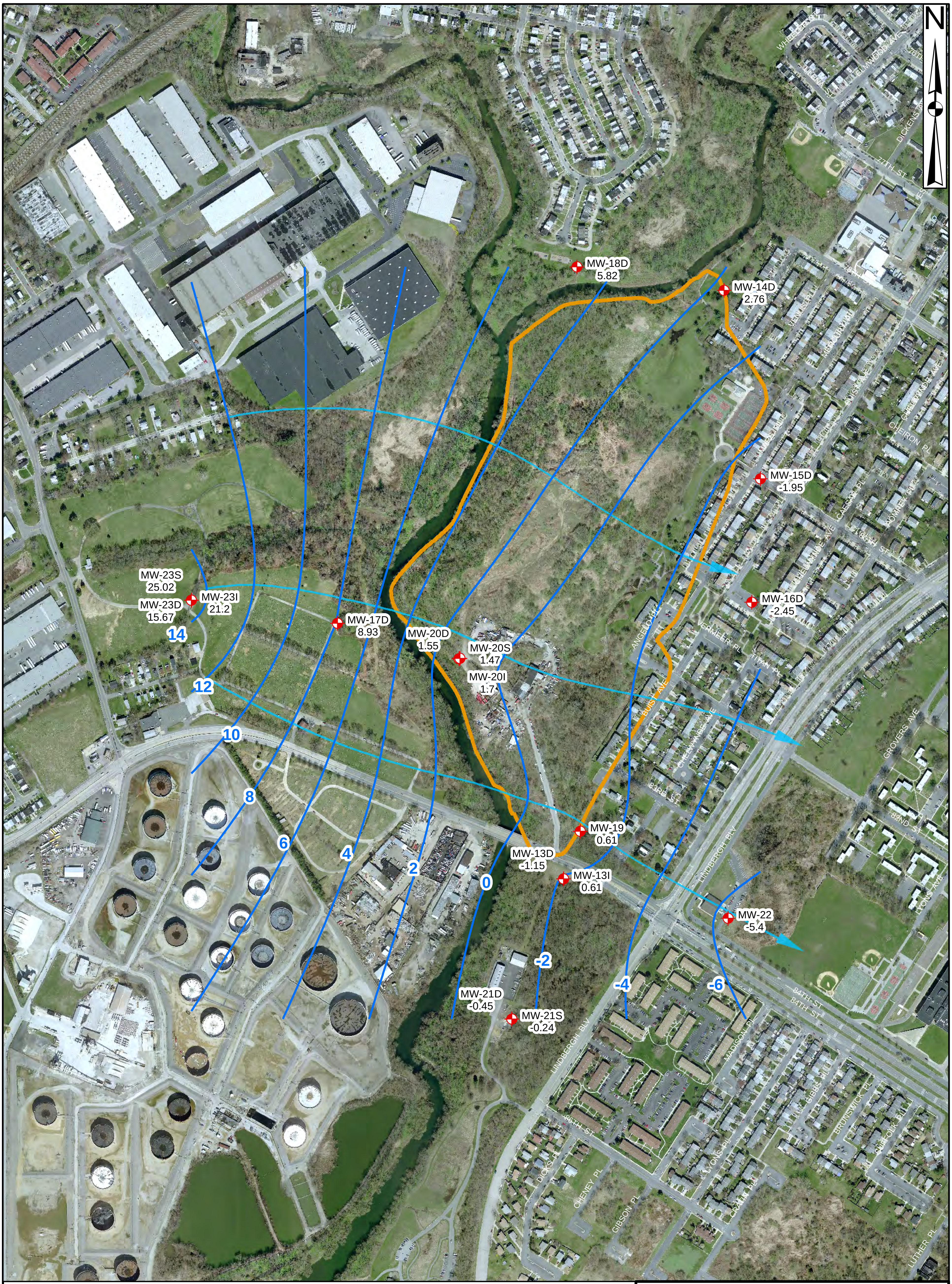
500 250 0 500 1,000
Feet

TETRA TECH

DEEP (BEDROCK)
GROUNDWATER CONTOUR MAP
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
GW Contour Map Deep 201412	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 3-26	0	02/14/19



C:\ALL_PROJECTS\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\GW CONTOUR MAP DEEP 201507.MXD MKB 2/12/2019

Legend

- Deep groundwater Well
- -4 Deep Aquifer Groundwater Contours
- Groundwater Flow Direction
- Historical Extent of Clearview Landfill
- 8.93 Deep Groundwater Elevation (ft msl), Measured in July 2015

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

500 250 0 500 1,000
Feet

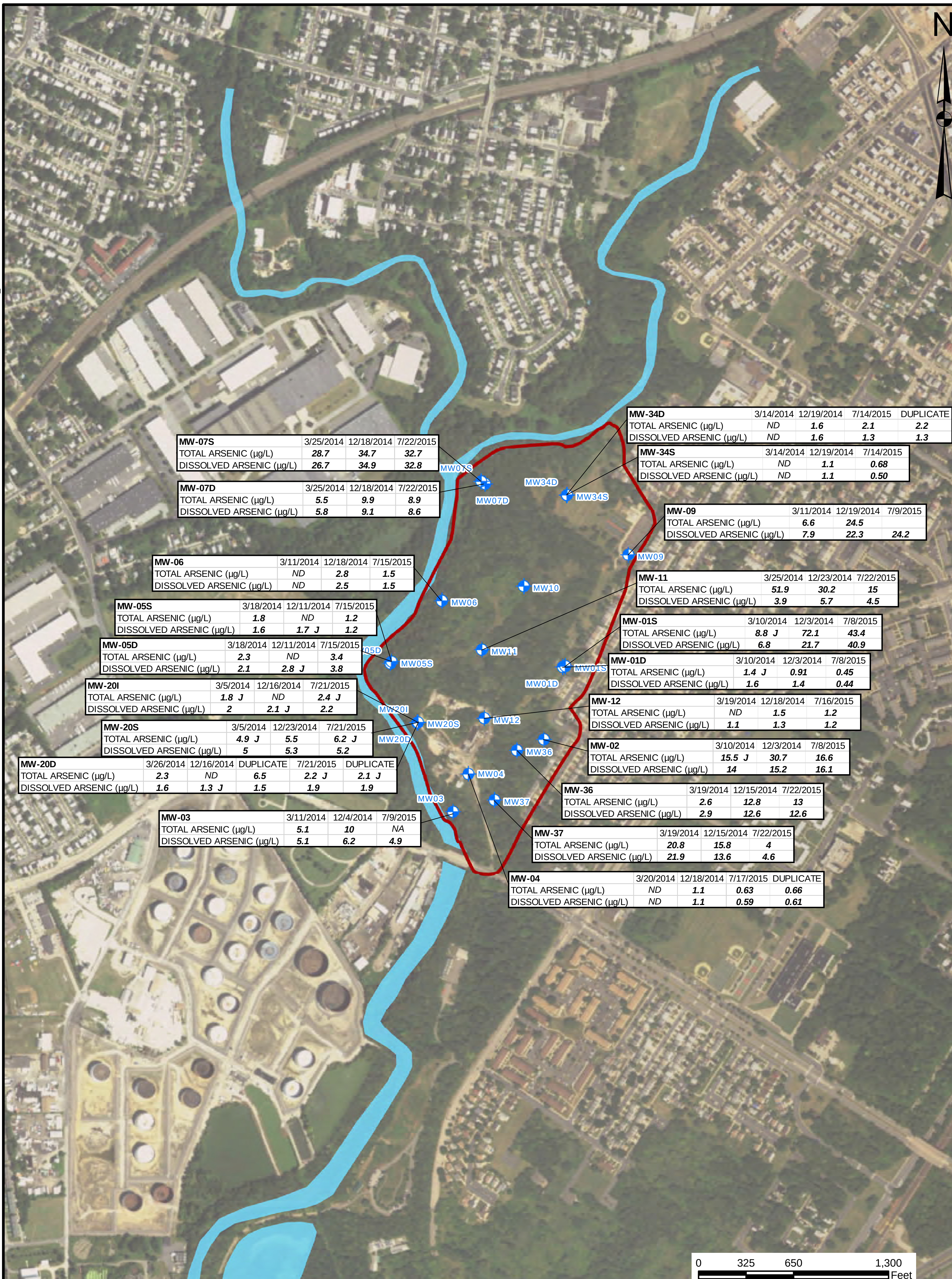
TETRA TECH

DEEP (BEDROCK)
GROUNDWATER CONTOUR MAP
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES,
PENNSYLVANIA

FILE	SCALE
GW Contour Map Deep 201507	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 3-27	0	02/12/19

C:\ALL_PROJECTS\LCDA\GIS\FIG 4-01 GW ARSENIC INSIDE.MXD MKB 11/10/2016



LEGEND

1.2 ARSENIC ABOVE RSL SCREENING CRITERIA OF 0.052 µg/L

0.01 ARSENIC BELOW RSL SCREENING CRITERIA OF 0.052 µg/L

µg/L MICROGRAMS PER LITER

NA NOT AVAILABLE

ND NOT DETECTED

J ESTIMATED VALUE

MONITORING WELL

HISTORICAL EXTENT OF CLEARVIEW LANDFILL

TETRA TECH

GROUNDWATER SAMPLING RESULTS
ARSENIC
LANDFILL AREA GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	FIG 4-01 GW ARSENIC INSIDE.mxd	SCALE	PER SCALE BAR
FIGURE NUMBER	**FIGURE 4-1**	REV 0	DATE 11/10/16

LEGEND

µg/L	VOLATILE GASES IN MICROGRAMS PER LITER
ND	NOT DETECTED
NA	NOT AVAILABLE
J	ESTIMATED VALUE
	MONITORING WELL
	HISTORICAL EXTENT OF CLEARVIEW LANDFILL

NOTES:
1. THE CONTAMINANTS SHOWN ON FIGURE WERE DETECTED IN GROUNDWATER SAMPLES AT LEAST ONCE ABOVE THEIR RESPECTIVE RSLs FOR TAP WATER.
2. BOLD VALUES EXCEED THEIR RESPECTIVE RSLs.

TETRA TECH

GROUNDWATER SAMPLING RESULTS
VOCS
LANDFILL AREA GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE	
FIG 4-02 GW VOC INSIDE.mxd	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 4-2	0	11/10/16

LEGEND

- ***1.2*** 1,4-DIOXANE ABOVE RSL SCREENING CRITERIA OF 0.46 µg/L
- *0.01* 1,4-DIOXANE BELOW RSL SCREENING CRITERIA OF 0.46 µg/L
- µg/L MICROGRAMS PER LITER
- *NA* NOT AVAILABLE
- *ND* NOT DETECTED
- *J* ESTIMATED VALUE
- MONITORING WELL LOCATION
- HISTORICAL EXTENT OF CLEARVIEW LANDFILL

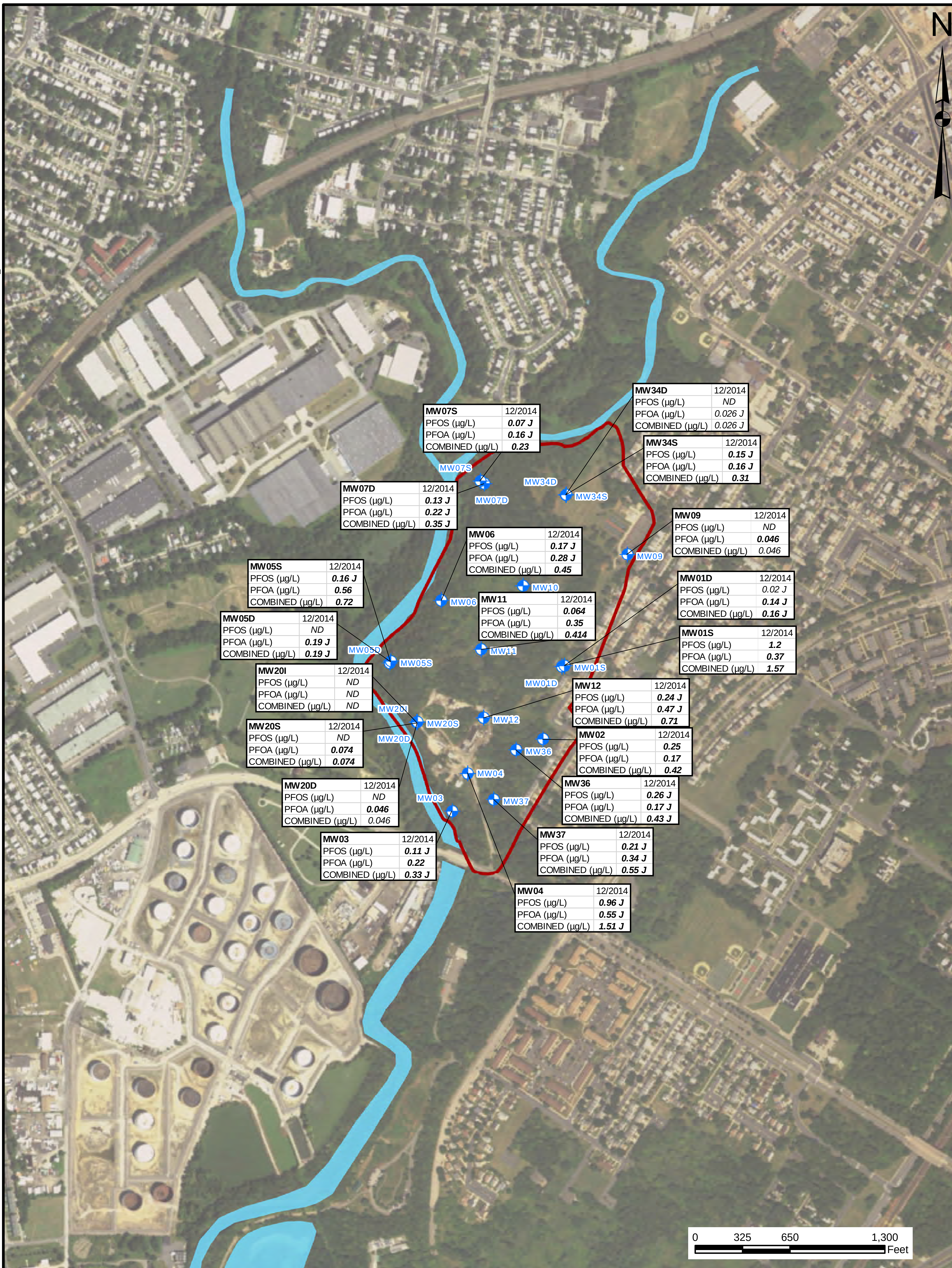
TETRA TECH

GROUNDWATER SAMPLING RESULTS
1,4-DIOXANE
LANDFILL AREA GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
FIG 4-03 GW 14D INSIDE.mxd	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 4-3	0	11/10/16

C:\ALL_PROJECTS\LCDA\GIS\FIG 4-04 GW PFO INSIDE.MXD MKB 11/10/2016



LEGEND

µg/L MICROGRAMS PER LITER

ND NOT DETECTED

J ESTIMATED VALUE

MONITORING WELL

HISTORICAL EXTENT OF CLEARVIEW LANDFILL

NOTES:
1. VALUES IN BOLD EXCEED THEIR RESPECTIVE SCREENING LEVELS.
2. PFOA SCREENING VALUE IS 0.04 µg/L.
3. PFOS SCREENING VALUE IS 0.04 µg/L.
4. 2016 EPA LIFETIME ADVISORY LEVEL FOR COMBINED PFOA AND PFOS IS 0.07 µg/L.

TETRA TECH

GROUNDWATER SAMPLING RESULTS
PFOA AND PFOS
LANDFILL AREA GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE	
FIG 4-04 GW PFO INSIDE.mxd	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 4-4	0	11/10/16

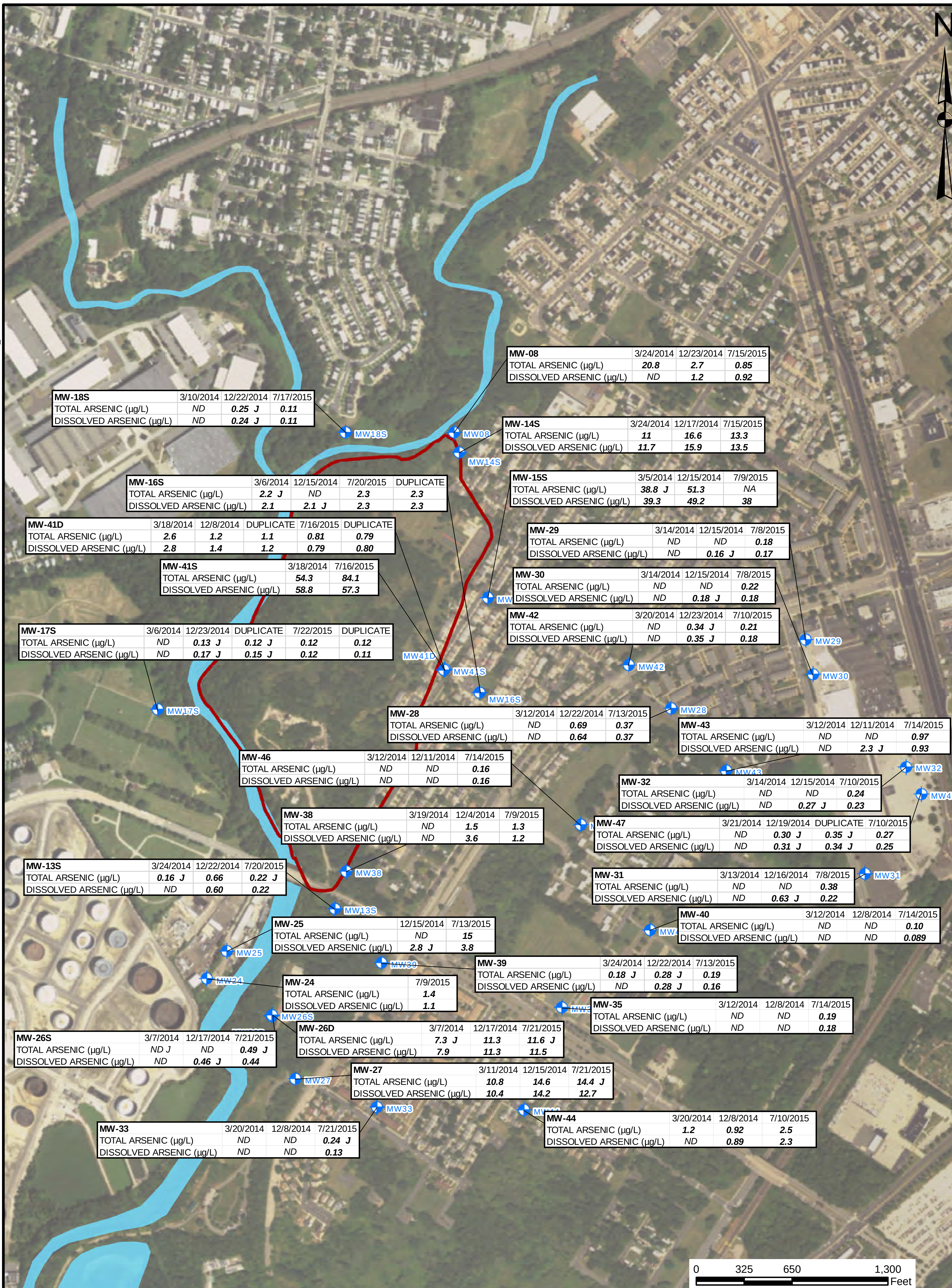
TETRA TECH

GROUNDWATER SAMPLING RESULTS
DISSOLVED GASES
LANDFILL AREA GROUNDWATER

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES,
PENNSYLVANIA

FILE FIG 4-05 GW METHANE INSIDE.mxd	SCALE PER SCALE BAR	
FIGURE NUMBER **FIGURE 4-5**	REV 0	DATE 10/30/16

C:\ALL_PROJECTS\LCDA\GIS\FIG 4-06 GW ARSENIC OUTSIDE SHALLOW.MXD MKB 11/10/2016



MW-08	3/24/2014	12/23/2014	7/15/2015
TOTAL ARSENIC (µg/L)	*20.8*	*2.7*	*0.85*
DISSOLVED ARSENIC (µg/L)	*ND*	*1.2*	*0.92*

MW-18S	3/10/2014	12/22/2014	7/17/2015
TOTAL ARSENIC (µg/L)	*ND*	*0.25 J*	*0.11*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.24 J*	*0.11*

MW-14S	3/24/2014	12/17/2014	7/15/2015
TOTAL ARSENIC (µg/L)	*11*	*16.6*	*13.3*
DISSOLVED ARSENIC (µg/L)	*11.7*	*15.9*	*13.5*

MW-16S	3/6/2014	12/15/2014	7/20/2015	DUPLICATE
TOTAL ARSENIC (µg/L)	*2.2 J*	*ND*	*2.3*	*2.3*
DISSOLVED ARSENIC (µg/L)	*2.1*	*2.1 J*	*2.3*	*2.3*

MW-15S	3/5/2014	12/15/2014	7/9/2015
TOTAL ARSENIC (µg/L)	*38.8 J*	*51.3*	*NA*
DISSOLVED ARSENIC (µg/L)	*39.3*	*49.2*	*38*

MW-41D	3/18/2014	12/8/2014	DUPLICATE	7/16/2015	DUPLICATE
TOTAL ARSENIC (µg/L)	*2.6*	*1.2*	*1.1*	*0.81*	*0.79*
DISSOLVED ARSENIC (µg/L)	*2.8*	*1.4*	*1.2*	*0.79*	*0.80*

MW-29	3/14/2014	12/15/2014	7/8/2015
TOTAL ARSENIC (µg/L)	*ND*	*ND*	*0.18*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.16 J*	*0.17*

MW-41S	3/18/2014	7/16/2015
TOTAL ARSENIC (µg/L)	*54.3*	*84.1*
DISSOLVED ARSENIC (µg/L)	*58.8*	*57.3*

MW-30	3/14/2014	12/15/2014	7/8/2015
TOTAL ARSENIC (µg/L)	*ND*	*ND*	*0.22*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.18 J*	*0.18*

MW-42	3/20/2014	12/23/2014	7/10/2015
TOTAL ARSENIC (µg/L)	*ND*	*0.34 J*	*0.21*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.35 J*	*0.18*

MW-17S	3/6/2014	12/23/2014	DUPLICATE	7/22/2015	DUPLICATE
TOTAL ARSENIC (µg/L)	*ND*	*0.13 J*	*0.12 J*	*0.12*	*0.12*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.17 J*	*0.15 J*	*0.12*	*0.11*

MW-28	3/12/2014	12/22/2014	7/13/2015
TOTAL ARSENIC (µg/L)	*ND*	*0.69*	*0.37*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.64*	*0.37*

MW-43	3/12/2014	12/11/2014	7/14/2015
TOTAL ARSENIC (µg/L)	*ND*	*ND*	*0.97*
DISSOLVED ARSENIC (µg/L)	*ND*	*2.3 J*	*0.93*

MW-46	3/12/2014	12/11/2014	7/14/2015
TOTAL ARSENIC (µg/L)	*ND*	*ND*	*0.16*
DISSOLVED ARSENIC (µg/L)	*ND*	*ND*	*0.16*

MW-32	3/14/2014	12/15/2014	7/10/2015
TOTAL ARSENIC (µg/L)	*ND*	*ND*	*0.24*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.27 J*	*0.23*

MW-38	3/19/2014	12/4/2014	7/9/2015
TOTAL ARSENIC (µg/L)	*ND*	*1.5*	*1.3*
DISSOLVED ARSENIC (µg/L)	*ND*	*3.6*	*1.2*

MW-47	3/21/2014	12/19/2014	DUPLICATE	7/10/2015
TOTAL ARSENIC (µg/L)	*ND*	*0.30 J*	*0.35 J*	*0.27*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.31 J*	*0.34 J*	*0.25*

MW-13S	3/24/2014	12/22/2014	7/20/2015
TOTAL ARSENIC (µg/L)	*0.16 J*	*0.66*	*0.22 J*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.60*	*0.22*

MW-31	3/13/2014	12/16/2014	7/8/2015
TOTAL ARSENIC (µg/L)	*ND*	*ND*	*0.38*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.63 J*	*0.22*

MW-40	3/12/2014	12/8/2014	7/14/2015
TOTAL ARSENIC (µg/L)	*ND*	*ND*	*0.10*
DISSOLVED ARSENIC (µg/L)	*ND*	*ND*	*0.089*

MW-25	12/15/2014	7/13/2015
TOTAL ARSENIC (µg/L)	*ND*	*15*
DISSOLVED ARSENIC (µg/L)	*2.8 J*	*3.8*

MW-39	3/24/2014	12/22/2014	7/13/2015
TOTAL ARSENIC (µg/L)	*0.18 J*	*0.28 J*	*0.19*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.28 J*	*0.16*

MW-24	7/9/2015
TOTAL ARSENIC (µg/L)	*1.4*
DISSOLVED ARSENIC (µg/L)	*1.1*

MW-35	3/12/2014	12/8/2014	7/14/2015
TOTAL ARSENIC (µg/L)	*ND*	*ND*	*0.19*
DISSOLVED ARSENIC (µg/L)	*ND*	*ND*	*0.18*

MW-26D	3/7/2014	12/17/2014	7/21/2015
TOTAL ARSENIC (µg/L)	*7.3 J*	*11.3*	*11.6 J*
DISSOLVED ARSENIC (µg/L)	*7.9*	*11.3*	*11.5*

MW-26S	3/7/2014	12/17/2014	7/21/2015
TOTAL ARSENIC (µg/L)	*ND J*	*ND*	*0.49 J*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.46 J*	*0.44*

MW-27	3/11/2014	12/15/2014	7/21/2015
TOTAL ARSENIC (µg/L)	*10.8*	*14.6*	*14.4 J*
DISSOLVED ARSENIC (µg/L)	*10.4*	*14.2*	*12.7*

MW-44	3/20/2014	12/8/2014	7/10/2015
TOTAL ARSENIC (µg/L)	*1.2*	*0.92*	*2.5*
DISSOLVED ARSENIC (µg/L)	*ND*	*0.89*	*2.3*

MW-33	3/20/2014	12/8/2014	7/21/2015
TOTAL ARSENIC (µg/L)	*ND*	*ND*	*0.24 J*
DISSOLVED ARSENIC (µg/L)	*ND*	*ND*	*0.13*

LEGEND

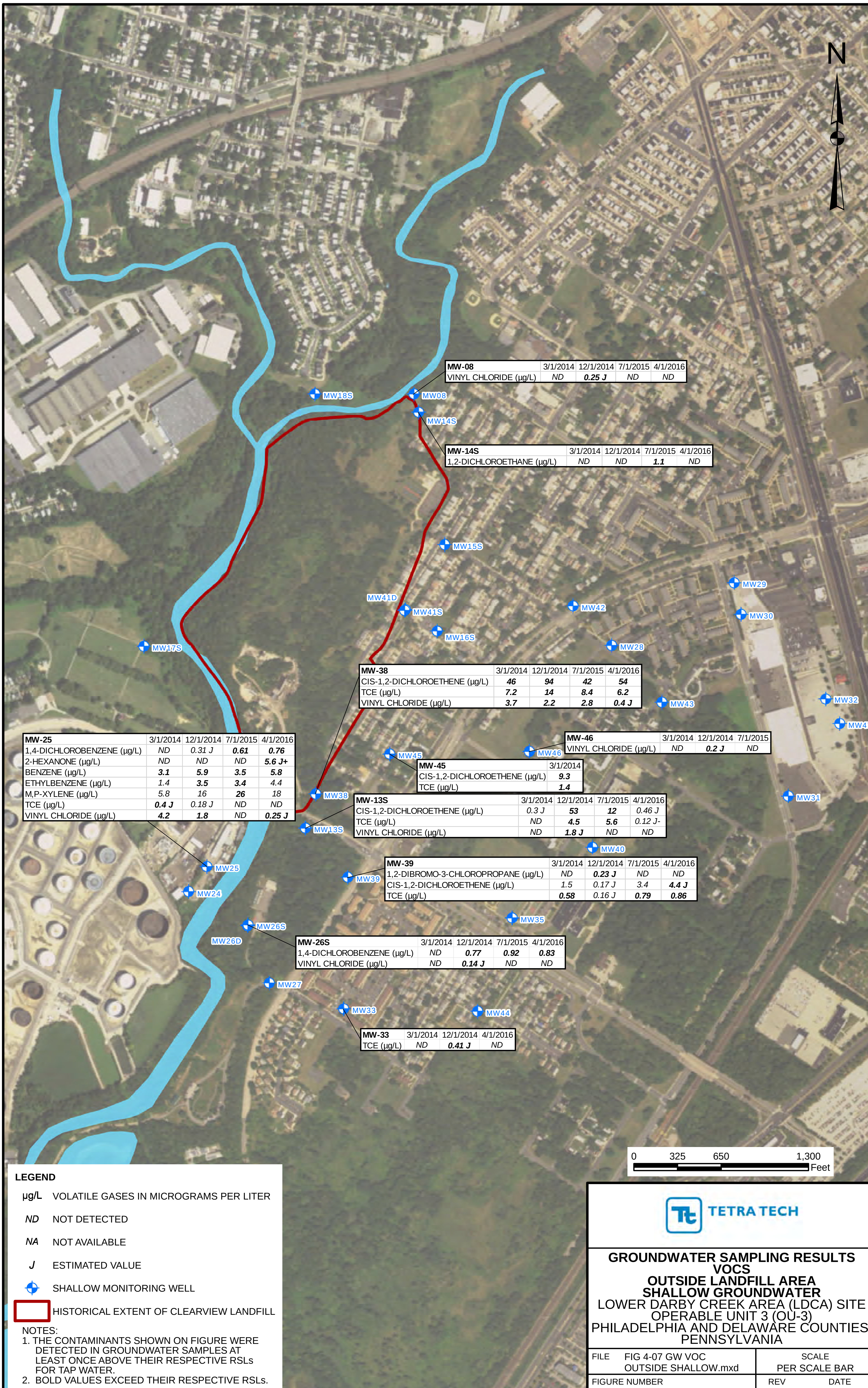
- ***1.2*** ARSENIC ABOVE RSL SCREENING CRITERIA OF 0.052 µg/L
- *0.01* ARSENIC BELOW RSL SCREENING CRITERIA OF 0.052 µg/L
- µg/L MICROGRAMS PER LITER
- *NA* NOT AVAILABLE
- *ND* NOT DETECTED
- *J* ESTIMATED VALUE
- SHALLOW MONITORING WELL
- HISTORICAL EXTENT OF CLEARVIEW LANDFILL

TETRA TECH

GROUNDWATER SAMPLING RESULTS
ARSENIC OUTSIDE LANDFILL
SHALLOW GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES,
PENNSYLVANIA

FILE	SCALE
FIG 4-06 GW ARSENIC OUTSIDE SHALLOW.mxd	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 4-6	0	11/10/16



MW-08	3/1/2014	12/1/2014	7/1/2015	4/1/2016
VINYL CHLORIDE (µg/L)	*ND*	***0.25 J***	*ND*	*ND*

MW-14S	3/1/2014	12/1/2014	7/1/2015	4/1/2016
1,2-DICHLOROETHANE (µg/L)	*ND*	*ND*	***1.1***	*ND*

MW-38	3/1/2014	12/1/2014	7/1/2015	4/1/2016
CIS-1,2-DICHLOROETHENE (µg/L)	***46***	***94***	***42***	***54***
TCE (µg/L)	***7.2***	***14***	***8.4***	***6.2***
VINYL CHLORIDE (µg/L)	***3.7***	***2.2***	***2.8***	***0.4 J***

MW-46	3/1/2014	12/1/2014	7/1/2015
VINYL CHLORIDE (µg/L)	*ND*	***0.2 J***	*ND*

MW-25	3/1/2014	12/1/2014	7/1/2015	4/1/2016
1,4-DICHLOROBENZENE (µg/L)	*ND*	*0.31 J*	***0.61***	***0.76***
2-HEXANONE (µg/L)	*ND*	*ND*	*ND*	***5.6 J+***
BENZENE (µg/L)	***3.1***	***5.9***	***3.5***	***5.8***
ETHYLBENZENE (µg/L)	*1.4*	***3.5***	***3.4***	*4.4*
M,P-XYLENE (µg/L)	*5.8*	*16*	***26***	*18*
TCE (µg/L)	***0.4 J***	*0.18 J*	*ND*	*ND*
VINYL CHLORIDE (µg/L)	***4.2***	***1.8***	*ND*	***0.25 J***

MW-45	3/1/2014
CIS-1,2-DICHLOROETHENE (µg/L)	***9.3***
TCE (µg/L)	***1.4***

MW-13S	3/1/2014	12/1/2014	7/1/2015	4/1/2016
CIS-1,2-DICHLOROETHENE (µg/L)	*0.3 J*	***53***	***12***	*0.46 J*
TCE (µg/L)	*ND*	***4.5***	***5.6***	*0.12 J-*
VINYL CHLORIDE (µg/L)	*ND*	***1.8 J***	*ND*	*ND*

MW-39	3/1/2014	12/1/2014	7/1/2015	4/1/2016
1,2-DIBROMO-3-CHLOROPROPANE (µg/L)	*ND*	***0.23 J***	*ND*	*ND*
CIS-1,2-DICHLOROETHENE (µg/L)	*1.5*	*0.17 J*	*3.4*	***4.4 J***
TCE (µg/L)	***0.58***	*0.16 J*	***0.79***	***0.86***

MW-26S	3/1/2014	12/1/2014	7/1/2015	4/1/2016
1,4-DICHLOROBENZENE (µg/L)	*ND*	***0.77***	***0.92***	***0.83***
VINYL CHLORIDE (µg/L)	*ND*	***0.14 J***	*ND*	*ND*

MW-33	3/1/2014	12/1/2014	4/1/2016
TCE (µg/L)	*ND*	***0.41 J***	*ND*

LEGEND

µg/L VOLATILE GASES IN MICROGRAMS PER LITER

ND NOT DETECTED

NA NOT AVAILABLE

J ESTIMATED VALUE

SHALLOW MONITORING WELL

HISTORICAL EXTENT OF CLEARVIEW LANDFILL

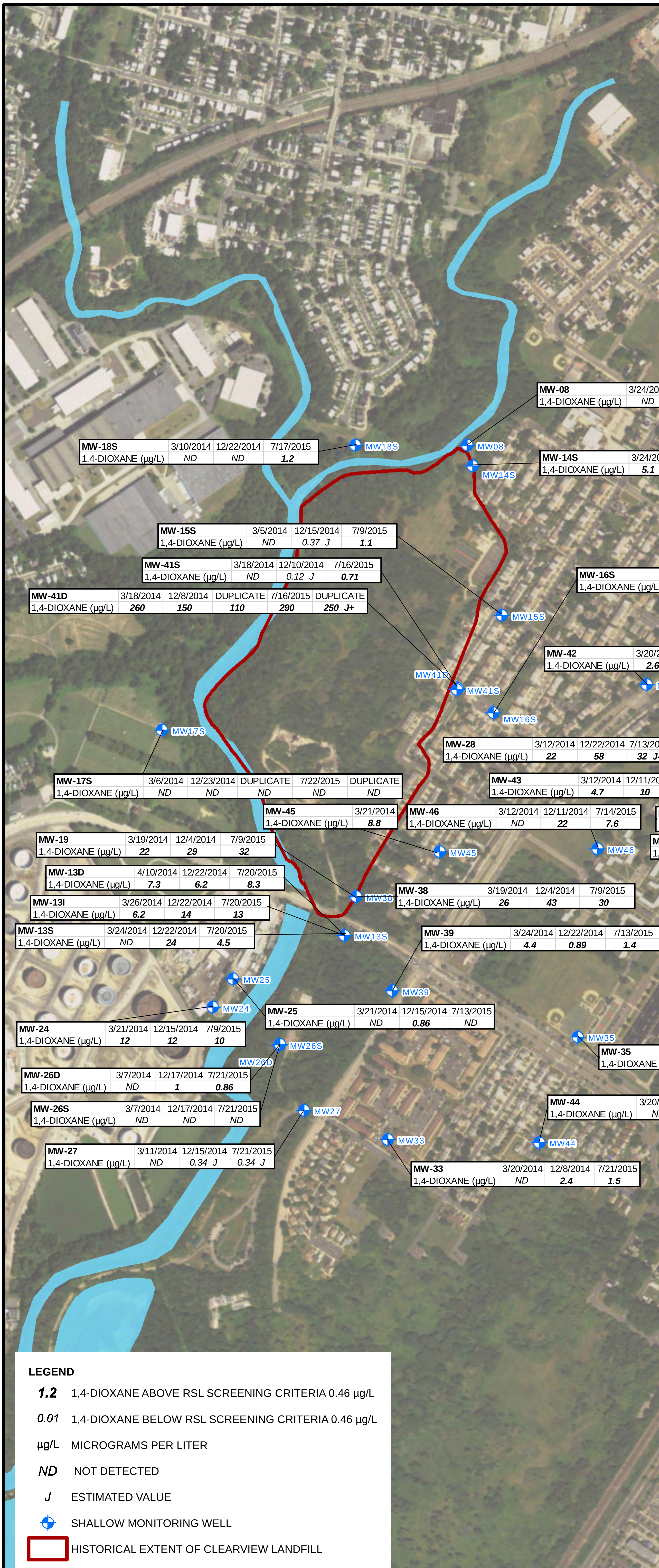
NOTES:
1. THE CONTAMINANTS SHOWN ON FIGURE WERE DETECTED IN GROUNDWATER SAMPLES AT LEAST ONCE ABOVE THEIR RESPECTIVE RSLs FOR TAP WATER.
2. BOLD VALUES EXCEED THEIR RESPECTIVE RSLs.

TETRA TECH

GROUNDWATER SAMPLING RESULTS
VOCS
OUTSIDE LANDFILL AREA
SHALLOW GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE	
FIG 4-07 GW VOC OUTSIDE SHALLOW.mxd	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 4-7	0	11/10/16

C:\ALL_PROJECTS\LCDA\GIS\FIG 4-08 GW 14D OUTSIDE SHALLOW.MXD MKB 11/21/2016

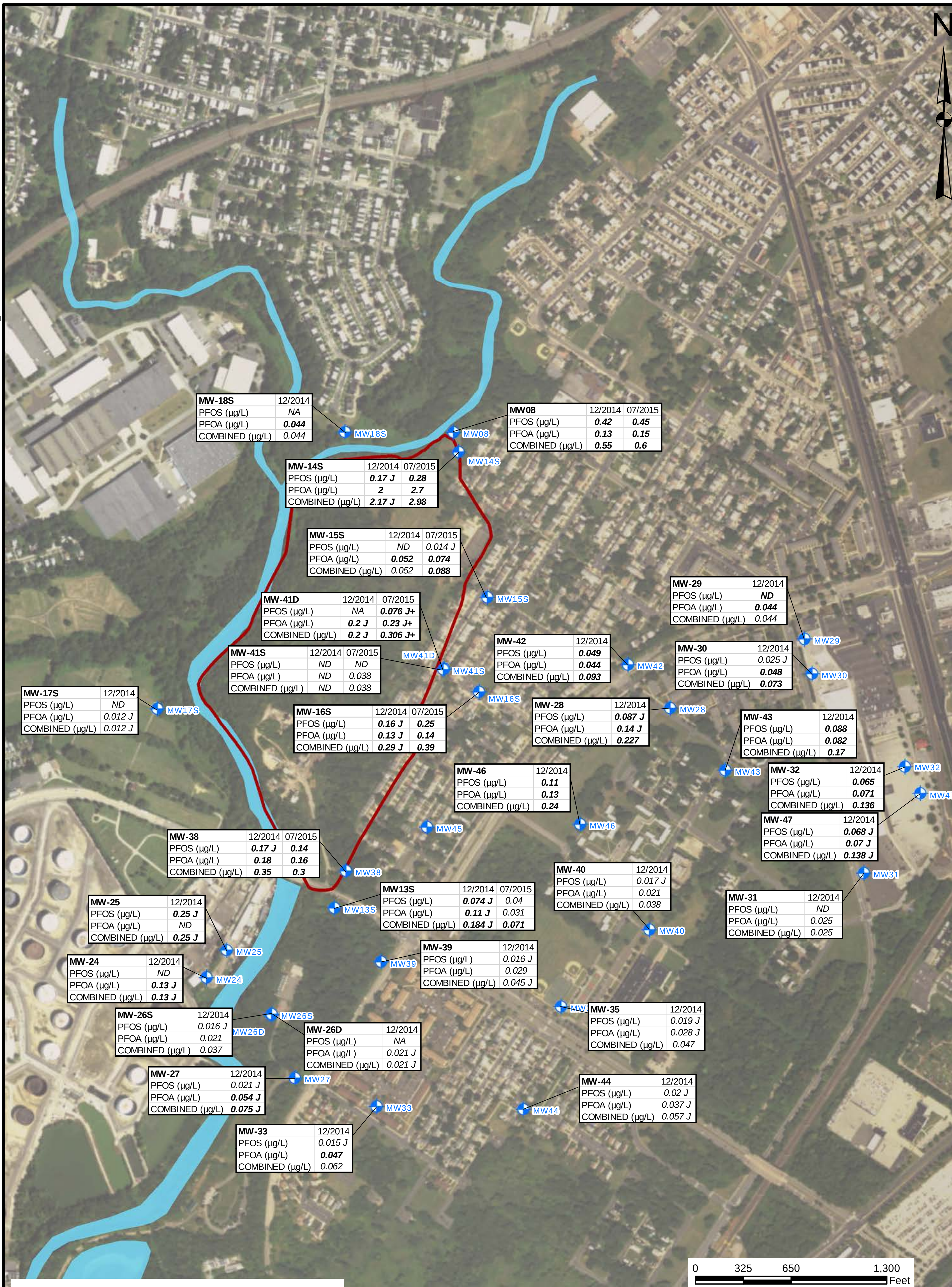


TETRA TECH

GROUNDWATER SAMPLING RESULTS
1,4-DIOXANE OUTSIDE LANDFILL
SHALLOW GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	FIG 4-08 GW 14D OUTSIDE SHALLOW.mxd	SCALE PER SCALE BAR	
FIGURE NUMBER	**FIGURE 4-8**	REV 0	DATE 11/21/16

C:\ALL_PROJECTS\LCDA\GIS\FIG 4-09 GW PFO OUTSIDE SHALLOW.MXD MKB 3/22/2017



LEGEND

µg/L MICROGRAMS PER LITER

ND NOT DETECTED

J ESTIMATED VALUE

SHALLOW MONITORING WELL

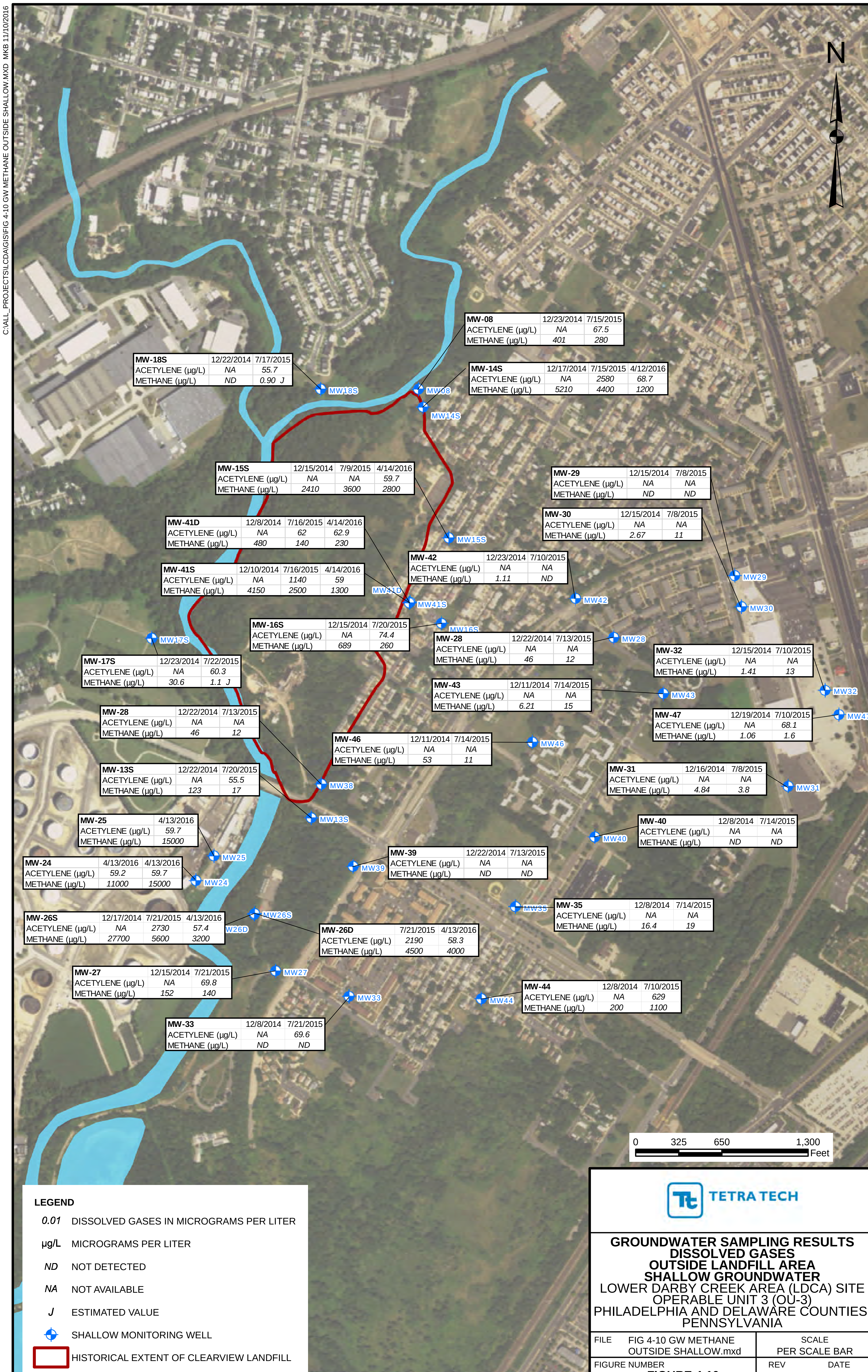
HISTORICAL EXTENT OF CLEARVIEW LANDFILL

NOTES:
1. VALUES IN BOLD EXCEED THEIR RESPECTIVE SCREENING LEVELS.
2. PFOA SCREENING VALUE IS 0.04 µg/L.
3. PFOS SCREENING VALUE IS 0.04 µg/L.
4. 2016 EPA LIFETIME ADVISORY LEVEL FOR COMBINED PFOA AND PFOS IS 0.07 µg/L.

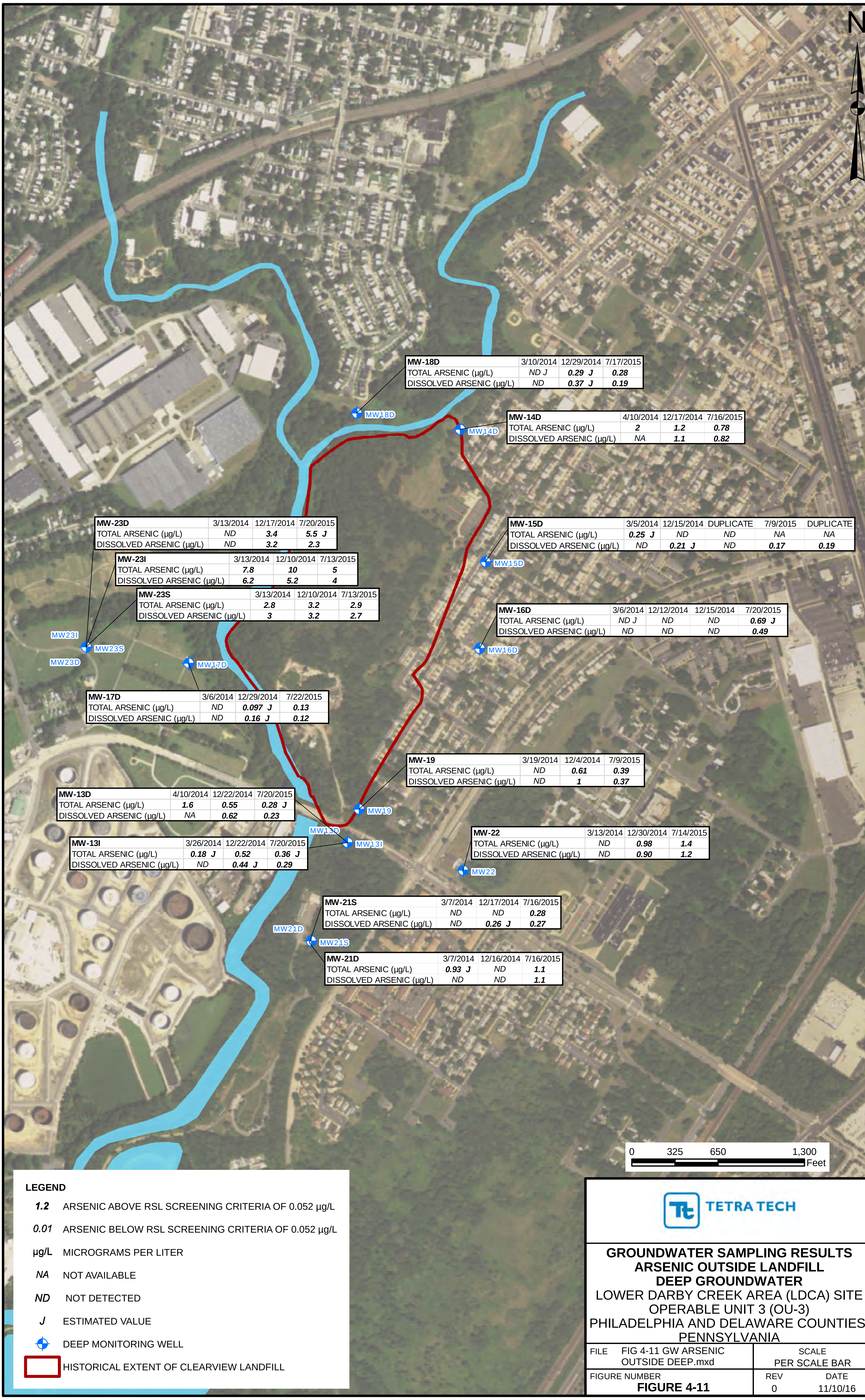
TETRA TECH

GROUNDWATER SAMPLING RESULTS
PFOA AND PFOS OUTSIDE LANDFILL
SHALLOW GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	FIG 4-09 GW PFO OUTSIDE SHALLOW.mxd	SCALE	PER SCALE BAR
FIGURE NUMBER	**FIGURE 4-9**	REV 0	DATE 03/22/17


C:\ALL_PROJECTS\LCDA\GIS\FIG 4-10 GW METHANE OUTSIDE SHALLOW.MXD MKB 11/10/2016
N
MW-08 12/23/2014 7/15/2015
ACETYLENE (µg/L) NA 67.5
METHANE (µg/L) 401 280
MW-18S 12/22/2014 7/17/2015
ACETYLENE (µg/L) NA 55.7
METHANE (µg/L) ND 0.90 J
MW-14S 12/17/2014 7/15/2015 4/12/2016
ACETYLENE (µg/L) NA 2580 68.7
METHANE (µg/L) 5210 4400 1200
MW18S
MW08
MW14S
MW-15S 12/15/2014 7/9/2015 4/14/2016
ACETYLENE (µg/L) NA NA 59.7
METHANE (µg/L) 2410 3600 2800
MW-29 12/15/2014 7/8/2015
ACETYLENE (µg/L) NA NA
METHANE (µg/L) ND ND
MW-30 12/15/2014 7/8/2015
ACETYLENE (µg/L) NA NA
METHANE (µg/L) 2.67 11
MW-41D 12/8/2014 7/16/2015 4/14/2016
ACETYLENE (µg/L) NA 62 62.9
METHANE (µg/L) 480 140 230
MW15S
MW-42 12/23/2014 7/10/2015
ACETYLENE (µg/L) NA NA
METHANE (µg/L) 1.11 ND
MW-41S 12/10/2014 7/16/2015 4/14/2016
ACETYLENE (µg/L) NA 1140 59
METHANE (µg/L) 4150 2500 1300
MW29
MW41D
MW41S
MW42
MW30
MW-16S 12/15/2014 7/20/2015
ACETYLENE (µg/L) NA 74.4
METHANE (µg/L) 689 260
MW16S
MW17S
MW-28 12/22/2014 7/13/2015
ACETYLENE (µg/L) NA NA
METHANE (µg/L) 46 12
MW28
MW-32 12/15/2014 7/10/2015
ACETYLENE (µg/L) NA NA
METHANE (µg/L) 1.41 13
MW-17S 12/23/2014 7/22/2015
ACETYLENE (µg/L) NA 60.3
METHANE (µg/L) 30.6 1.1 J
MW-43 12/11/2014 7/14/2015
ACETYLENE (µg/L) NA NA
METHANE (µg/L) 6.21 15
MW43
MW32
MW-47 12/19/2014 7/10/2015
ACETYLENE (µg/L) NA 68.1
METHANE (µg/L) 1.06 1.6
MW47
MW-28 12/22/2014 7/13/2015
ACETYLENE (µg/L) NA NA
METHANE (µg/L) 46 12
MW-46 12/11/2014 7/14/2015
ACETYLENE (µg/L) NA NA
METHANE (µg/L) 53 11
MW46
MW-31 12/16/2014 7/8/2015
ACETYLENE (µg/L) NA NA
METHANE (µg/L) 4.84 3.8
MW31
MW-13S 12/22/2014 7/20/2015
ACETYLENE (µg/L) NA 55.5
METHANE (µg/L) 123 17
MW38
MW13S
MW-25 4/13/2016
ACETYLENE (µg/L) 59.7
METHANE (µg/L) 15000
MW-40 12/8/2014 7/14/2015
ACETYLENE (µg/L) NA NA
METHANE (µg/L) ND ND
MW40
MW25
MW-24 4/13/2016 4/13/2016
ACETYLENE (µg/L) 59.2 59.7
METHANE (µg/L) 11000 15000
MW24
MW-39 12/22/2014 7/13/2015
ACETYLENE (µg/L) NA NA
METHANE (µg/L) ND ND
MW39
MW35
MW-35 12/8/2014 7/14/2015
ACETYLENE (µg/L) NA NA
METHANE (µg/L) 16.4 19
MW-26S 12/17/2014 7/21/2015 4/13/2016
ACETYLENE (µg/L) NA 2730 57.4
METHANE (µg/L) 27700 5600 3200
MW26S
MW26D
MW-26D 7/21/2015 4/13/2016
ACETYLENE (µg/L) 2190 58.3
METHANE (µg/L) 4500 4000
MW-27 12/15/2014 7/21/2015
ACETYLENE (µg/L) NA 69.8
METHANE (µg/L) 152 140
MW27
MW33
MW44
MW-44 12/8/2014 7/10/2015
ACETYLENE (µg/L) NA 629
METHANE (µg/L) 200 1100
MW-33 12/8/2014 7/21/2015
ACETYLENE (µg/L) NA 69.6
METHANE (µg/L) ND ND
0 325 650 1,300
Feet
LEGEND
0.01 DISSOLVED GASES IN MICROGRAMS PER LITER
µg/L MICROGRAMS PER LITER
ND NOT DETECTED
NA NOT AVAILABLE
J ESTIMATED VALUE
SHALLOW MONITORING WELL
HISTORICAL EXTENT OF CLEARVIEW LANDFILL
TETRA TECH
GROUNDWATER SAMPLING RESULTS
DISSOLVED GASES
OUTSIDE LANDFILL AREA
SHALLOW GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES,
PENNSYLVANIA
FILE FIG 4-10 GW METHANE OUTSIDE SHALLOW.mxd
SCALE PER SCALE BAR
FIGURE NUMBER FIGURE 4-10
REV 0
DATE 11/10/16

C:\ALL_PROJECTS\LCDA\GIS\FIG 4-11 GW ARSENIC OUTSIDE DEEP.MXD MKB 11/10/2016



MW-18D	3/10/2014	12/29/2014	7/17/2015
TOTAL ARSENIC (µg/L)	*ND J*	***0.29 J***	***0.28***
DISSOLVED ARSENIC (µg/L)	*ND*	***0.37 J***	***0.19***

MW-14D	4/10/2014	12/17/2014	7/16/2015
TOTAL ARSENIC (µg/L)	***2***	***1.2***	***0.78***
DISSOLVED ARSENIC (µg/L)	*NA*	***1.1***	***0.82***

MW-23D	3/13/2014	12/17/2014	7/20/2015
TOTAL ARSENIC (µg/L)	*ND*	***3.4***	***5.5 J***
DISSOLVED ARSENIC (µg/L)	*ND*	***3.2***	***2.3***

MW-15D	3/5/2014	12/15/2014	DUPLICATE	7/9/2015	DUPLICATE
TOTAL ARSENIC (µg/L)	***0.25 J***	*ND*	*ND*	*NA*	*NA*
DISSOLVED ARSENIC (µg/L)	*ND*	***0.21 J***	*ND*	***0.17***	***0.19***

MW-23I	3/13/2014	12/10/2014	7/13/2015
TOTAL ARSENIC (µg/L)	***7.8***	***10***	***5***
DISSOLVED ARSENIC (µg/L)	***6.2***	***5.2***	***4***

MW-23S	3/13/2014	12/10/2014	7/13/2015
TOTAL ARSENIC (µg/L)	***2.8***	***3.2***	***2.9***
DISSOLVED ARSENIC (µg/L)	***3***	***3.2***	***2.7***

MW-16D	3/6/2014	12/12/2014	12/15/2014	7/20/2015
TOTAL ARSENIC (µg/L)	*ND J*	*ND*	*ND*	***0.69 J***
DISSOLVED ARSENIC (µg/L)	*ND*	*ND*	*ND*	***0.49***

MW-17D	3/6/2014	12/29/2014	7/22/2015
TOTAL ARSENIC (µg/L)	*ND*	***0.097 J***	***0.13***
DISSOLVED ARSENIC (µg/L)	*ND*	***0.16 J***	***0.12***

MW-19	3/19/2014	12/4/2014	7/9/2015
TOTAL ARSENIC (µg/L)	*ND*	***0.61***	***0.39***
DISSOLVED ARSENIC (µg/L)	*ND*	***1***	***0.37***

MW-13D	4/10/2014	12/22/2014	7/20/2015
TOTAL ARSENIC (µg/L)	***1.6***	***0.55***	***0.28 J***
DISSOLVED ARSENIC (µg/L)	*NA*	***0.62***	***0.23***

MW-22	3/13/2014	12/30/2014	7/14/2015
TOTAL ARSENIC (µg/L)	*ND*	***0.98***	***1.4***
DISSOLVED ARSENIC (µg/L)	*ND*	***0.90***	***1.2***

MW-13I	3/26/2014	12/22/2014	7/20/2015
TOTAL ARSENIC (µg/L)	***0.18 J***	***0.52***	***0.36 J***
DISSOLVED ARSENIC (µg/L)	*ND*	***0.44 J***	***0.29***

MW-21S	3/7/2014	12/17/2014	7/16/2015
TOTAL ARSENIC (µg/L)	*ND*	*ND*	***0.28***
DISSOLVED ARSENIC (µg/L)	*ND*	***0.26 J***	***0.27***

MW-21D	3/7/2014	12/16/2014	7/16/2015
TOTAL ARSENIC (µg/L)	***0.93 J***	*ND*	***1.1***
DISSOLVED ARSENIC (µg/L)	*ND*	*ND*	***1.1***

LEGEND

1.2 ARSENIC ABOVE RSL SCREENING CRITERIA OF 0.052 µg/L

0.01 ARSENIC BELOW RSL SCREENING CRITERIA OF 0.052 µg/L

µg/L MICROGRAMS PER LITER

NA NOT AVAILABLE

ND NOT DETECTED

J ESTIMATED VALUE

DEEP MONITORING WELL

HISTORICAL EXTENT OF CLEARVIEW LANDFILL

TETRA TECH

GROUNDWATER SAMPLING RESULTS
ARSENIC OUTSIDE LANDFILL
DEEP GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	FIG 4-11 GW ARSENIC OUTSIDE DEEP.mxd	SCALE PER SCALE BAR	
FIGURE NUMBER	**FIGURE 4-11**	REV 0	DATE 11/10/16

C:\ALL_PROJECTS\LCDA\GIS\FIG 4-12 GW VOC OUTSIDE DEEP.MXD MKB 11/10/2016

MW-13I	3/1/2014	12/1/2014	7/1/2015	4/1/2016
CIS-1,2-DICHLOROETHENE (µg/L)	68	85	84	74 J-
TCE (µg/L)	44	53	59	44
VINYL CHLORIDE (µg/L)	ND	0.51 J	ND	0.38 J

MW-13D	3/1/2014	12/1/2014	7/1/2015	4/1/2016
CIS-1,2-DICHLOROETHENE (µg/L)	100	120	100	120
TCE (µg/L)	2.5	5.9	3.5	3.7
VINYL CHLORIDE (µg/L)	ND	0.69	ND	0.92

MW-19	3/1/2014	12/1/2014	7/1/2015	4/1/2016
1,1-DICHLOROETHANE (µg/L)	2.4 J	3.7 J	2.9 J+	3.6
1,1-DICHLOROETHENE (µg/L)	ND	7.3	4.7 J+	4.6
BENZENE (µg/L)	ND	0.88 J	0.65 J+	0.745
CIS-1,2-DICHLOROETHENE (µg/L)	1000	1800	1500	1750
TCE (µg/L)	260	420	330	295
VINYL CHLORIDE (µg/L)	ND	11	8.5 J+	9.7

MW-22	7/1/2015
CHLOROFORM (µg/L)	1.2

LEGEND

µg/L VOLATILE GASES IN MICROGRAMS PER LITER

ND NOT DETECTED

NA NOT AVAILABLE

J ESTIMATED VALUE

DEEP MONITORING WELL

HISTORICAL EXTENT OF CLEARVIEW LANDFILL

NOTES:
1. THE CONTAMINANTS SHOWN ON FIGURE WERE DETECTED IN GROUNDWATER SAMPLES AT LEAST ONCE ABOVE THEIR RESPECTIVE RSLs FOR TAP WATER.
2. BOLD VALUES EXCEED THEIR RESPECTIVE RSLs.

TETRA TECH

GROUNDWATER SAMPLING RESULTS
VOCS
OUTSIDE LANDFILL AREA
DEEP GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	FIG 4-12 GW VOC OUTSIDE DEEP.mxd	SCALE	PER SCALE BAR
FIGURE NUMBER	**FIGURE 4-12**	REV 0	DATE 11/10/16

C:\ALL_PROJECTS\LCDA\GIS\FIG 4-13 GW 14D OUTSIDE DEEP.MXD MKB 11/10/2016

MW-18D	3/10/2014	12/29/2014	7/17/2015
1,4-DIOXANE (µg/L)	*ND*	*ND*	*ND*

MW-14D	4/10/2014	12/17/2014	7/16/2015
1,4-DIOXANE (µg/L)	*ND*	*ND*	*ND*

MW-15D	3/5/2014	12/15/2014	DUPLICATE	7/9/2015	DUPLICATE
1,4-DIOXANE (µg/L)	*ND*	*0.086 J*	*ND*	*ND*	*0.38 J*

MW-23I	3/13/2014	12/10/2014	7/13/2015
1,4-DIOXANE (µg/L)	*ND*	*0.16 J*	*ND*

MW-23D	3/13/2014	12/17/2014	7/20/2015
1,4-DIOXANE (µg/L)	*ND*	*ND*	*ND*

MW-23S	3/13/2014	12/10/2014	7/13/2015
1,4-DIOXANE (µg/L)	*ND*	*0.20 J*	*ND*

MW-16D	3/6/2014	12/12/2014	12/15/2014	7/20/2015
1,4-DIOXANE (µg/L)	*ND*	*0.044 J*	*0.12 J*	*ND*

MW-17D	3/6/2014	12/29/2014	7/22/2015
1,4-DIOXANE (µg/L)	*ND*	*ND*	*0.24 J*

MW-19	3/19/2014	12/4/2014	7/9/2015
1,4-DIOXANE (µg/L)	***22***	***29***	***32***

MW-13D	4/10/2014	12/22/2014	7/20/2015
1,4-DIOXANE (µg/L)	***7.3***	***6.2***	***8.3***

MW-13I	3/26/2014	12/22/2014	7/20/2015
1,4-DIOXANE (µg/L)	***6.2***	***14***	***13***

MW-22	3/13/2014	12/30/2014	7/14/2015
1,4-DIOXANE (µg/L)	*ND*	*ND*	*0.33 J*

MW-21D	3/7/2014	12/16/2014	7/16/2015
1,4-DIOXANE (µg/L)	*ND*	***1.2***	*ND*

MW-21S	3/7/2014	12/17/2014	7/16/2015
1,4-DIOXANE (µg/L)	*ND*	***1.1***	*ND*

LEGEND

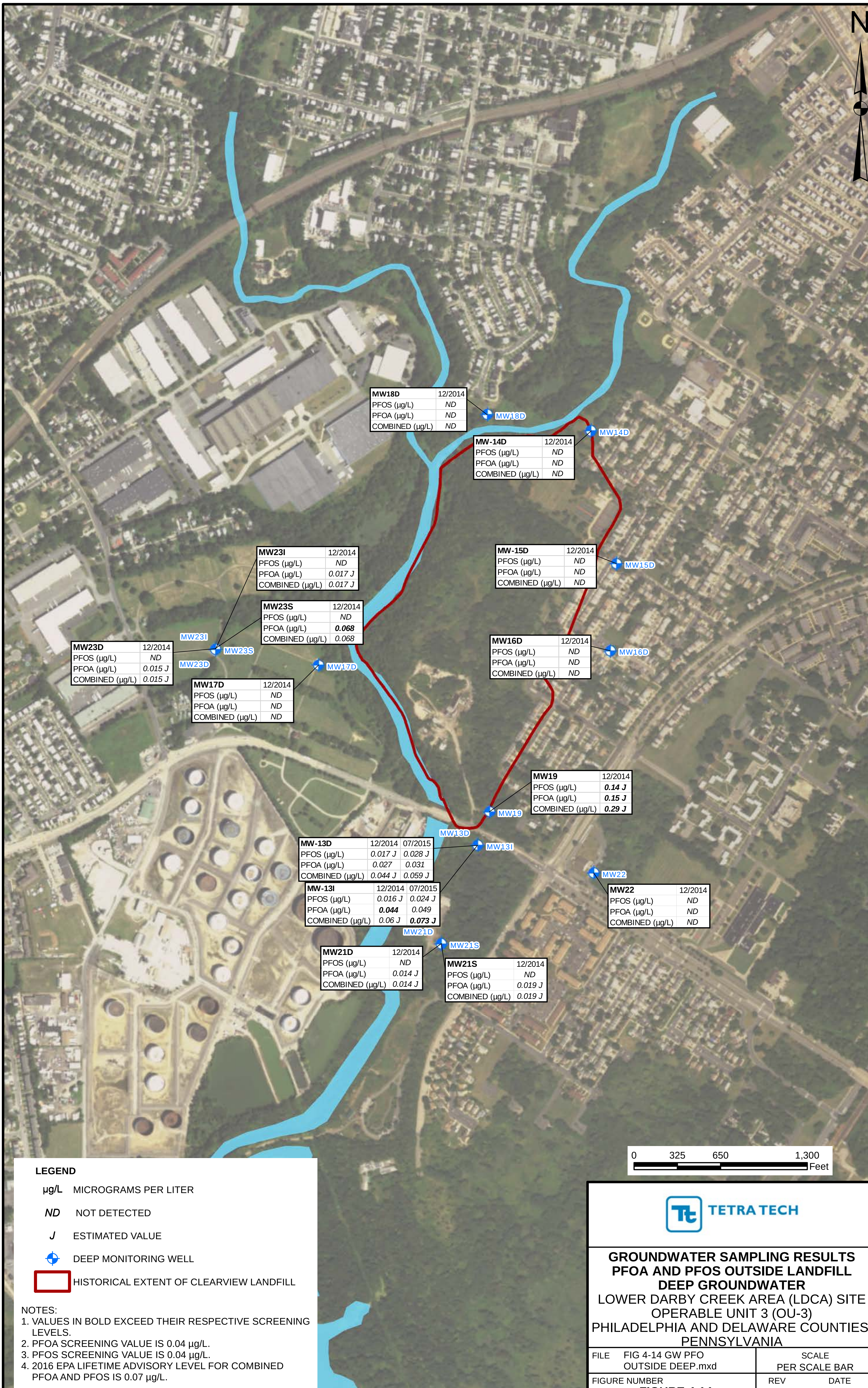
- ***1.2*** 1,4-DIOXANE ABOVE RSL SCREENING CRITERIA 0.46 µg/L
- *0.01* 1,4-DIOXANE BELOW RSL SCREENING CRITERIA 0.46 µg/L
- µg/L MICROGRAMS PER LITER
- *ND* NOT DETECTED
- *J* ESTIMATED VALUE
- DEEP MONITORING WELL
- HISTORICAL EXTENT OF CLEARVIEW LANDFILL

TETRA TECH

GROUNDWATER SAMPLING RESULTS
1,4-DIOXANE OUTSIDE LANDFILL
DEEP GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES,
PENNSYLVANIA

FILE	GW 14D OUTSIDE DEEP.mxd	SCALE	PER SCALE BAR
FIGURE NUMBER	**FIGURE 4-13**	REV 0	DATE 11/10/16

C:\ALL_PROJECTS\LCDA\GIS\FIG 4-14 GW PFO OUTSIDE DEEP.MXD MKB 3/22/2017



LEGEND

- µg/L MICROGRAMS PER LITER
- *ND* NOT DETECTED
- *J* ESTIMATED VALUE
- DEEP MONITORING WELL
- HISTORICAL EXTENT OF CLEARVIEW LANDFILL

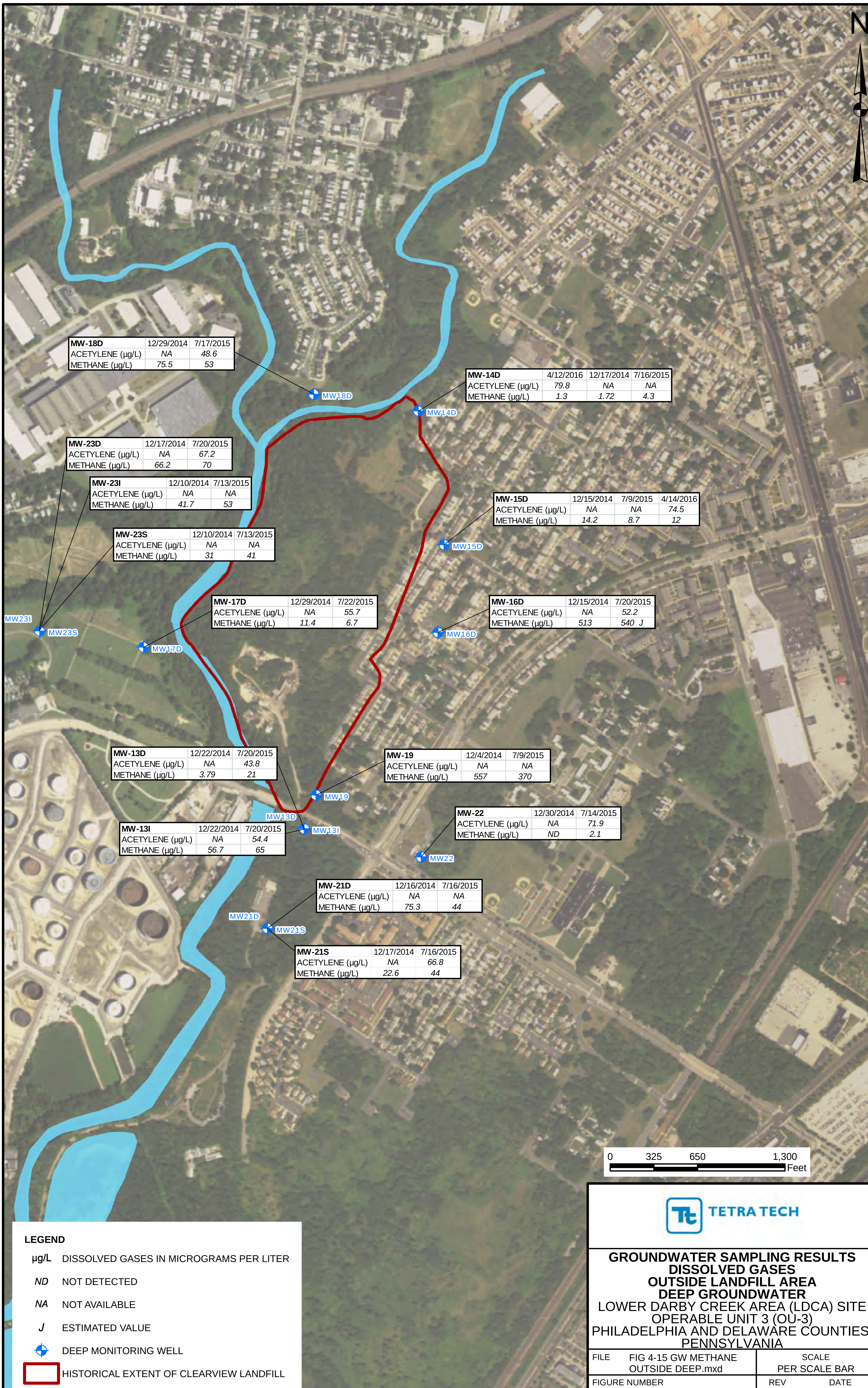
NOTES:
1. VALUES IN BOLD EXCEED THEIR RESPECTIVE SCREENING LEVELS.
2. PFOA SCREENING VALUE IS 0.04 µg/L.
3. PFOS SCREENING VALUE IS 0.04 µg/L.
4. 2016 EPA LIFETIME ADVISORY LEVEL FOR COMBINED PFOA AND PFOS IS 0.07 µg/L.

TETRA TECH

GROUNDWATER SAMPLING RESULTS
PFOA AND PFOS OUTSIDE LANDFILL
DEEP GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	FIG 4-14 GW PFO OUTSIDE DEEP.mxd	SCALE	PER SCALE BAR
FIGURE NUMBER	**FIGURE 4-14**	REV 0	DATE 03/22/17

C:\ALL_PROJECTS\LCDA\GIS\FIG 4-15 GW METHANE OUTSIDE DEEP.MXD MKB 11/10/2016



LEGEND

µg/L DISSOLVED GASES IN MICROGRAMS PER LITER

ND NOT DETECTED

NA NOT AVAILABLE

J ESTIMATED VALUE

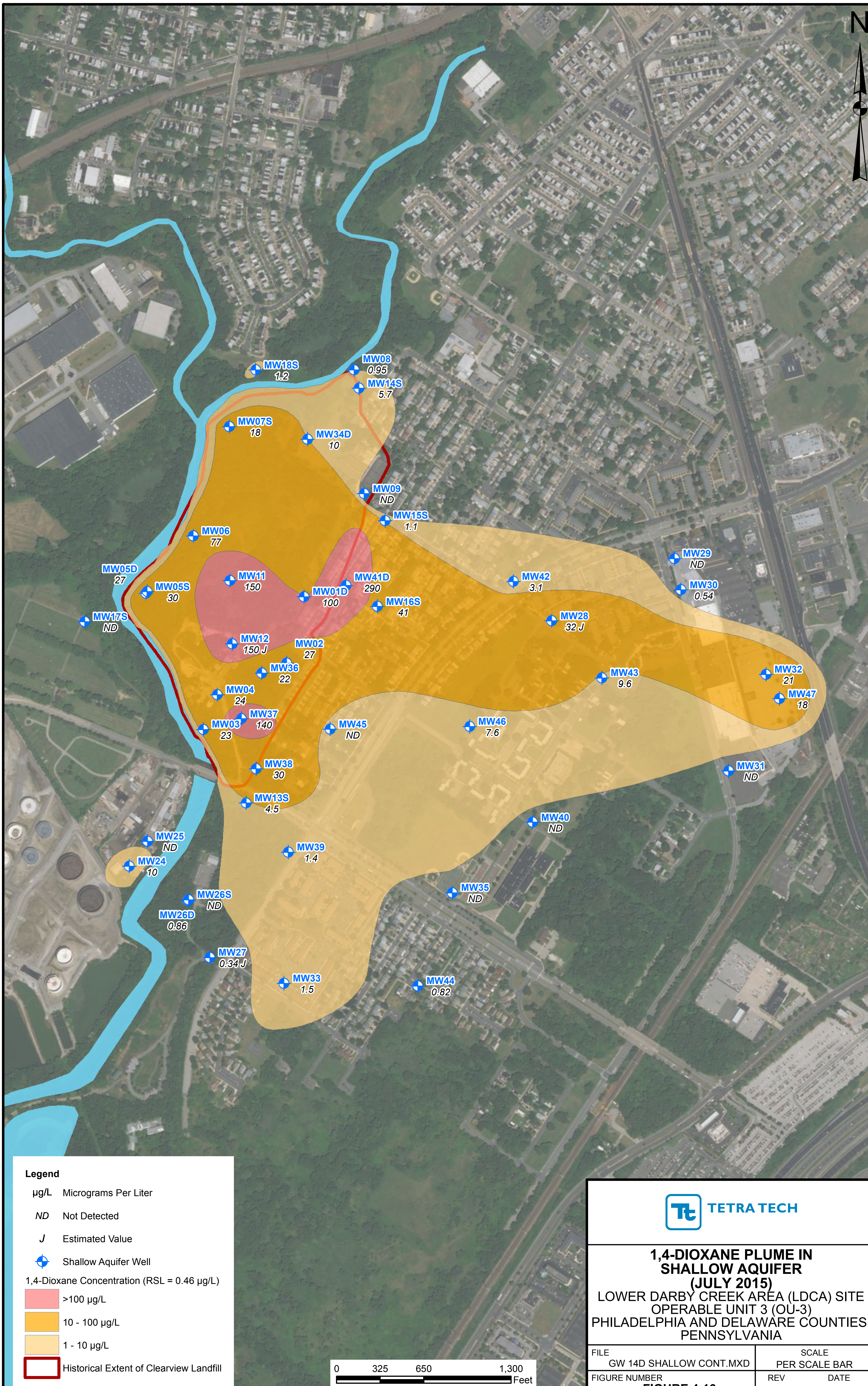
DEEP MONITORING WELL

HISTORICAL EXTENT OF CLEARVIEW LANDFILL

TETRA TECH

GROUNDWATER SAMPLING RESULTS
DISSOLVED GASES
OUTSIDE LANDFILL AREA
DEEP GROUNDWATER
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	FIG 4-15 GW METHANE OUTSIDE DEEP.mxd	SCALE	PER SCALE BAR
FIGURE NUMBER	**FIGURE 4-15**	REV 0	DATE 11/10/16



C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\GW 14D SHALLOW CONT.MXD MKB 1/26/2018

TETRA TECH

1,4-DIOXANE PLUME IN SHALLOW AQUIFER (JULY 2015)

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE	
GW 14D SHALLOW CONT.MXD	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 4-16	0	01/26/18

Legend

Deep Aquifer Well
μg/L Micrograms Per Liter
ND Not Detected
J Estimated Value
1,4-Dioxane Concentration (RSL = 0.46 μg/L)
>10 μg/L
1 - 10 μg/L
Historical Extent of Clearview Landfill

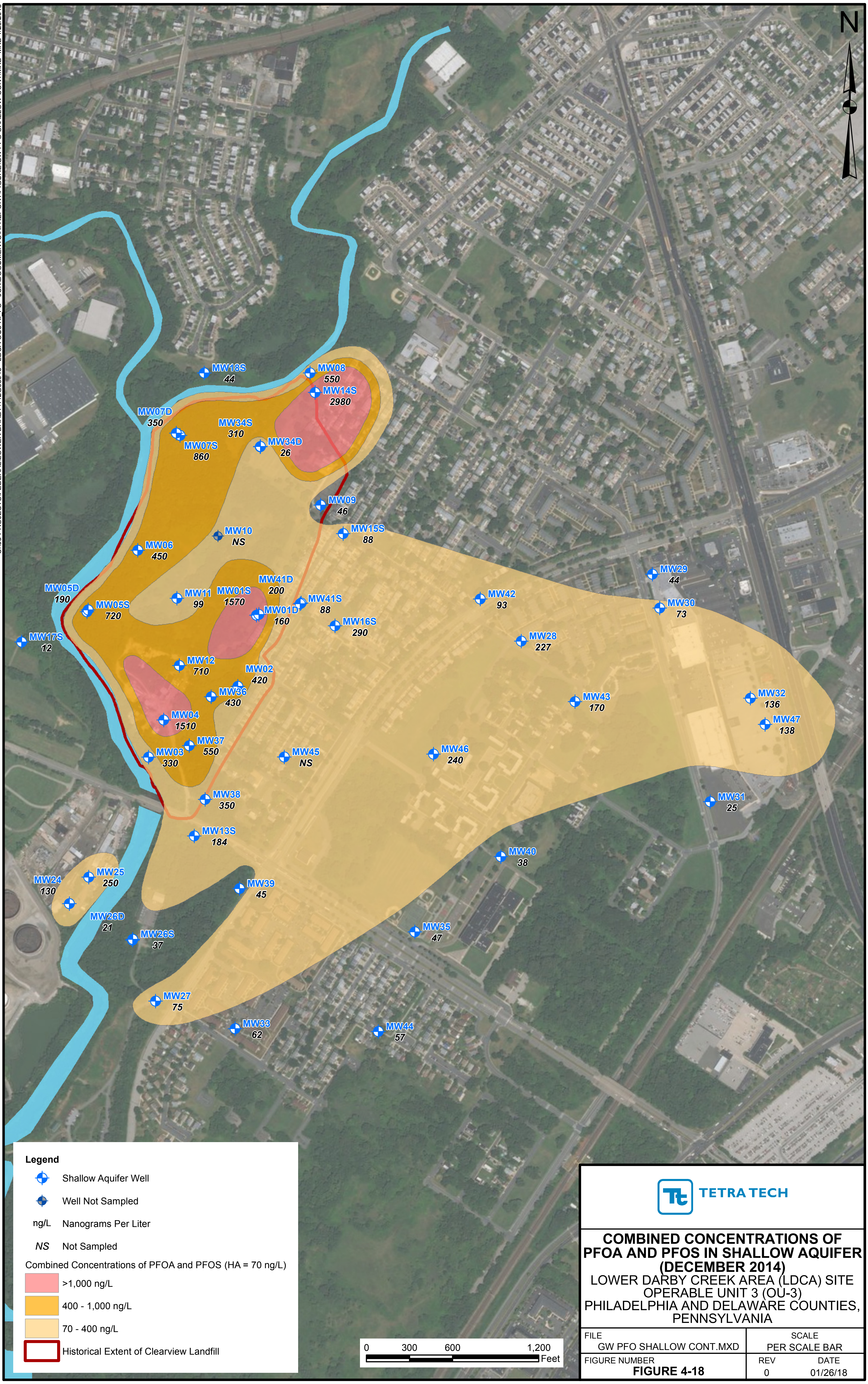
TETRA TECH

1,4-DIOXANE PLUME IN DEEP AQUIFER (JULY 2015)
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
GW 14D DEEP CONT.MXD	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 4-17	0	01/26/18

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\GW 14D DEEP CONT.MXD MKB 1/26/2018



C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI FS - JCK\DOCUMENTS\RI REPORT\FIGURE\GW PFO SHALLOW CONT.MXD MKB 1/26/2018

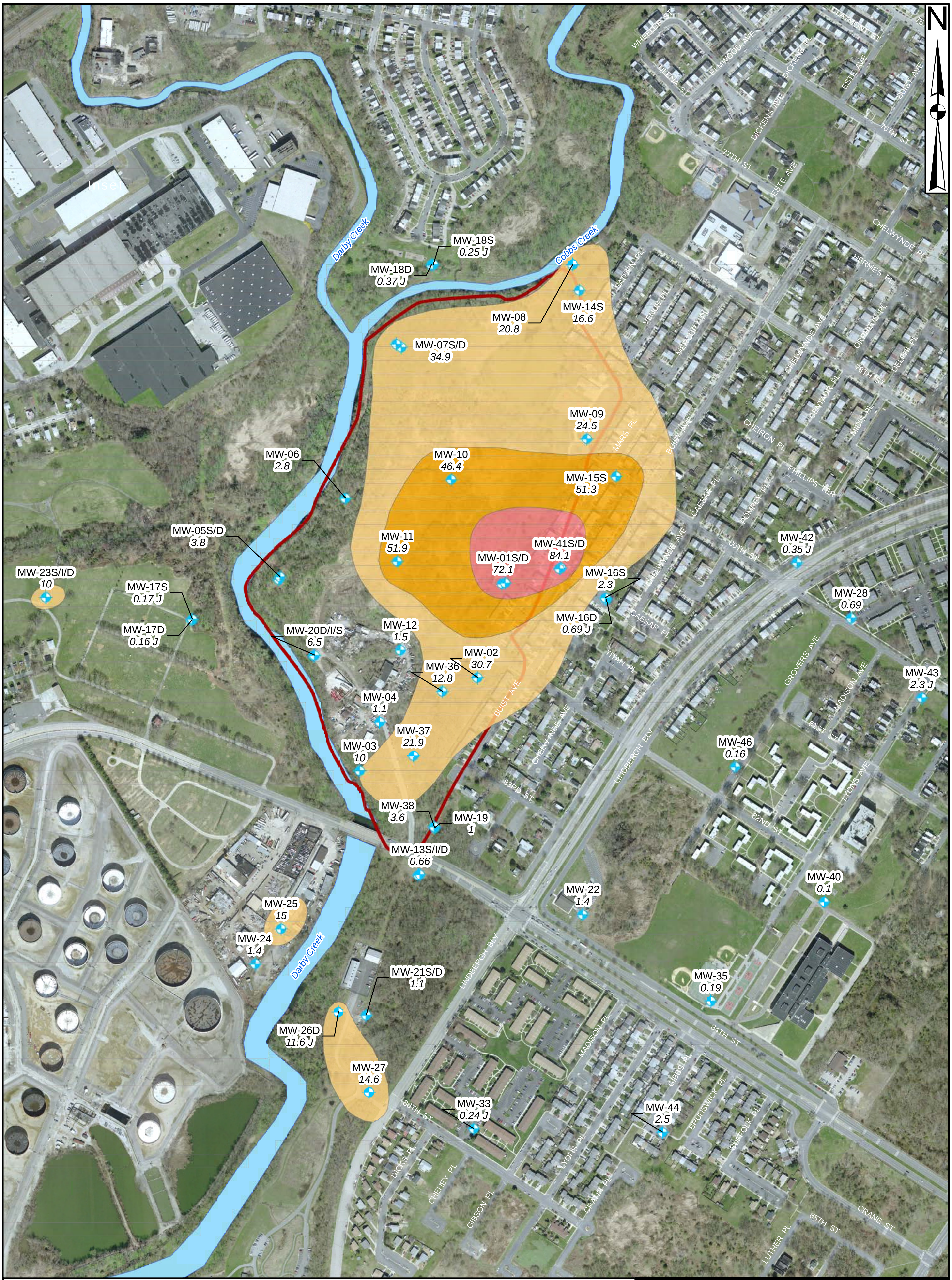
TETRA TECH

COMBINED CONCENTRATIONS OF PFOA AND PFOS IN SHALLOW AQUIFER (DECEMBER 2014)

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
GW PFO SHALLOW CONT.MXD	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 4-18	0	01/26/18



C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\ARSENIC PLUME.MXD MKB 1/16/2018

Legend

Monitoring Well

Arsenic Concentration

- >70 µg/L
- 40 - 70 µg/L
- 10 - 40 µg/L

µg/L Micrograms Per Liter

J Estimated Value

Historical Extent of Clearview Landfill

Note:
1. This figure shows groundwater sample locations and highest concentration of arsenic detected during three rounds of sampling in 2014 and 2015.
2. Drinking water MCL for arsenic is 10 µg/L.

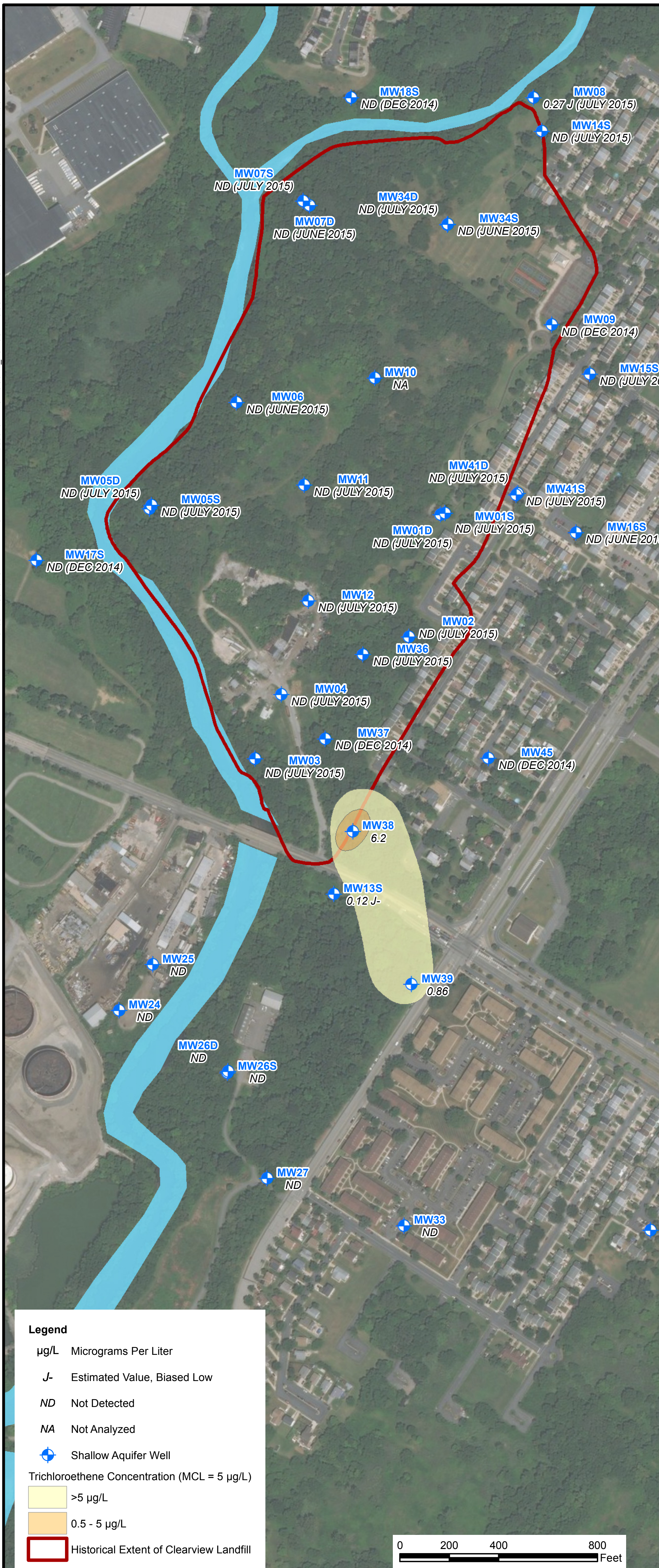
500 250 0 500 1,000
Feet

TETRA TECH

COMBINED ARSENIC GROUNDWATER PLUME
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
Arsenic Plume	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 4-19	0	01/16/18



C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\GW TCE SHALLOW CONT.MXD MKB 1/26/2018

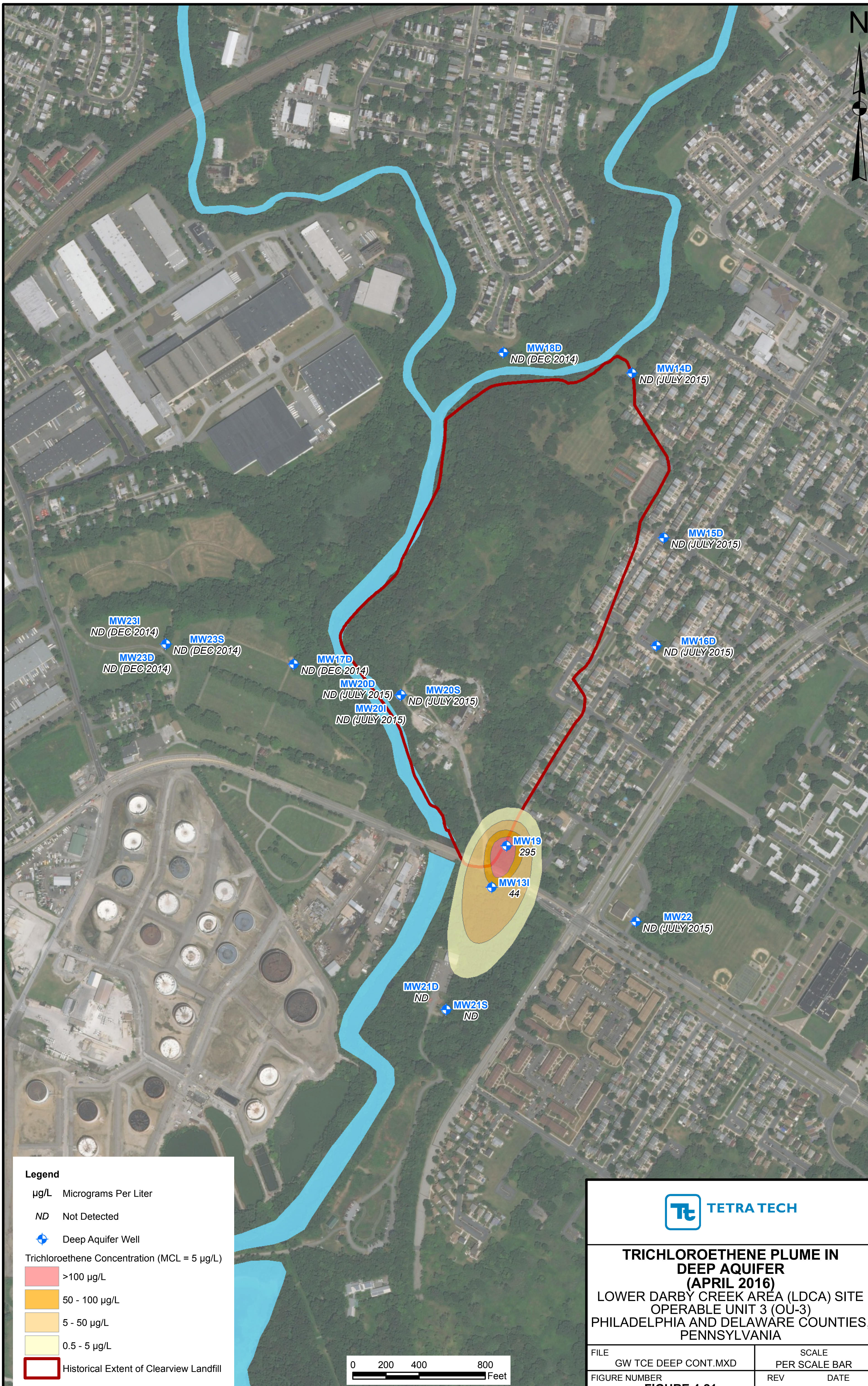
TETRA TECH

TRICHLOROETHENE PLUME IN SHALLOW AQUIFER (APRIL 2016)

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
GW TCE SHALLOW CONT.MXD	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 4-20	0	01/26/18



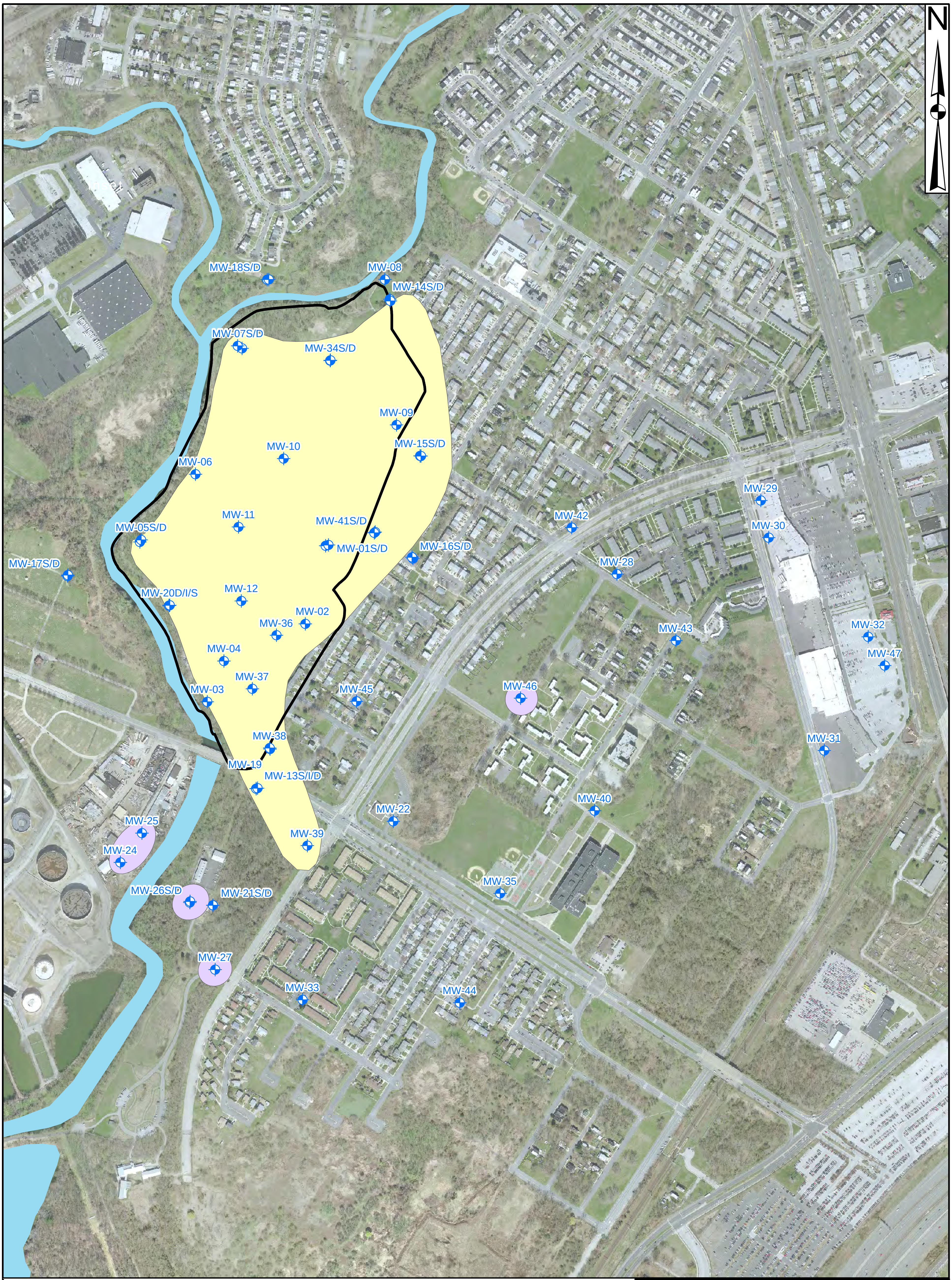
TRICHLOROETHENE PLUME IN DEEP AQUIFER (APRIL 2016)

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
GW TCE DEEP CONT.MXD	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 4-21	0	01/26/18

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\GW TCE DEEP CONT.MXD MKB 1/26/2018



C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\ARSENIC PLUME SHALLOW.MXD MKB 11/10/2017

Legend

- Monitoring Well Location
- Shallow Plume
- Shallow Plume (Potentially Unrelated to Site)
- Historical Extent of Clearview Landfill

600 300 0 600 1,200

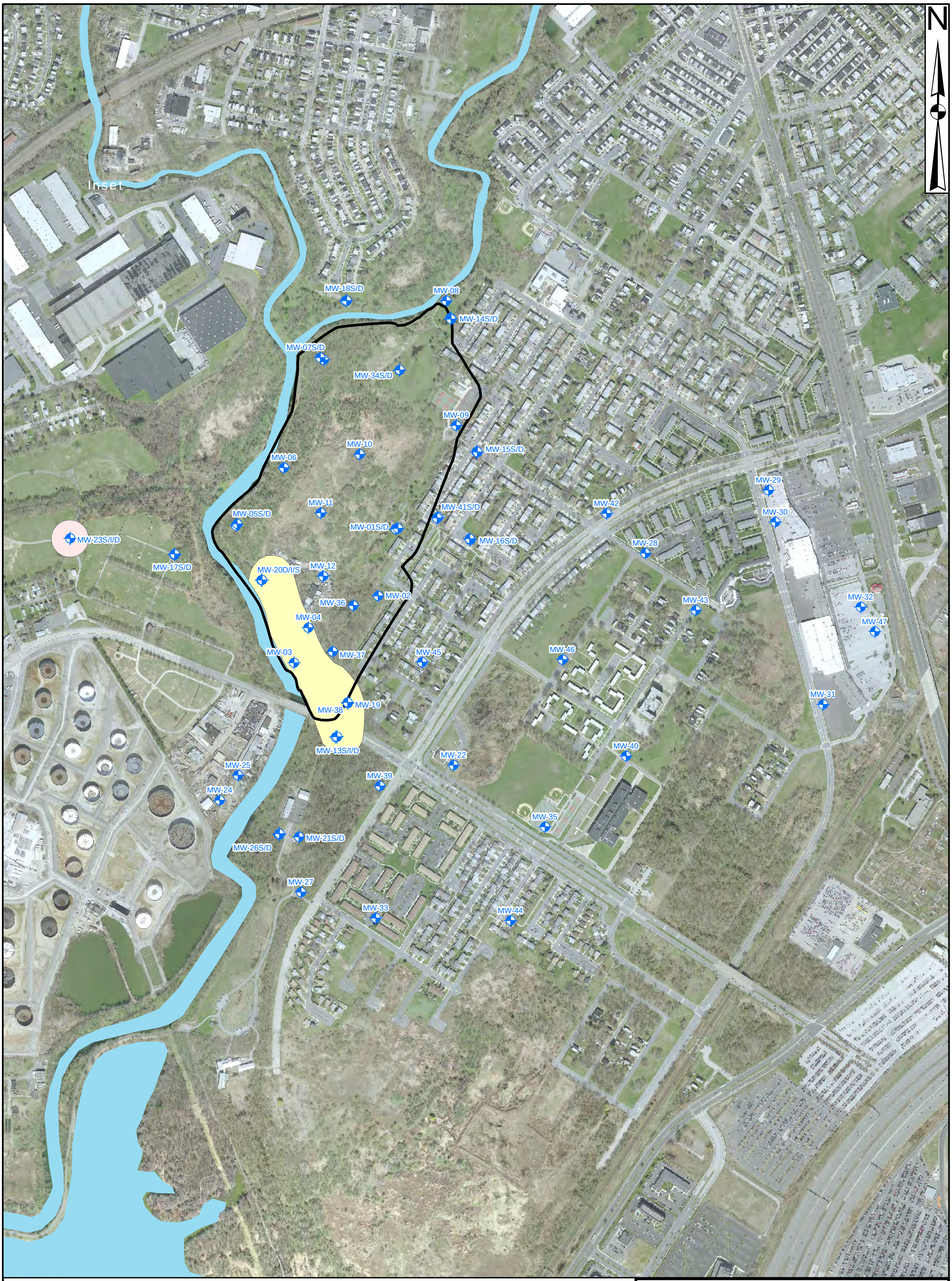
Feet

TETRA TECH

SHALLOW GROUNDWATER PLUME WITH CONCENTRATIONS ABOVE MCLS

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE	
Arsenic Plume Shallow	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 4-22	0	11/10/17



C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\ARSENIC PLUME DEEP.MXD MKB 11/6/2017

Legend

- Monitoring Well Location
- Deep Plume
- Deep Plume (Potentially Unrelated to Site)
- Historical Extent of Clearview Landfill

700 350 0 700 1,400

Feet

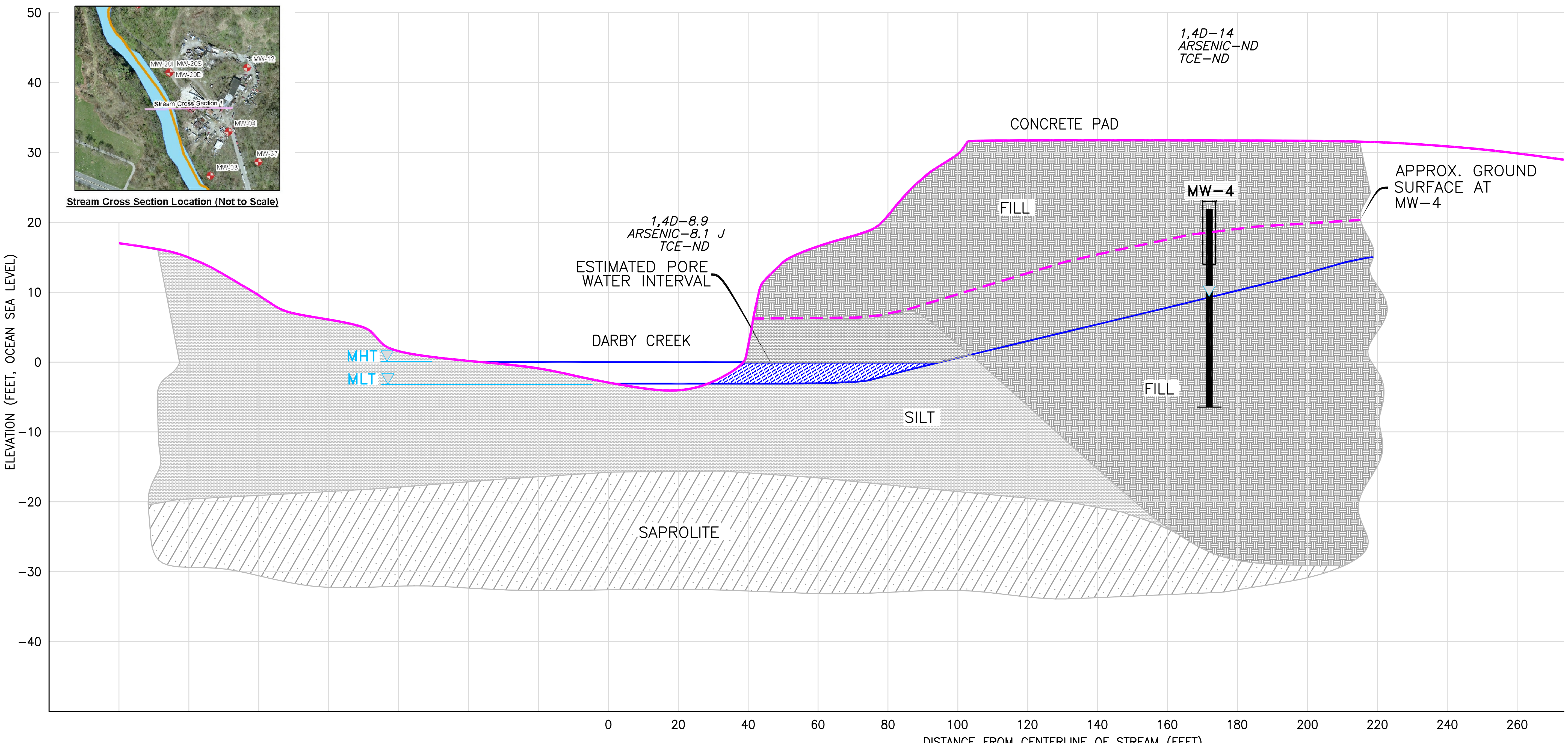
TETRA TECH

DEEP GROUNDWATER PLUME WITH CONCENTRATIONS ABOVE MCLS

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
Arsenic Plume Deep	PER SCALE BAR

FIGURE NUMBER	REV	DATE
FIGURE 4-23	0	11/06/17



LEGEND

MHT ▽ MEAN HIGH TIDE

MLT ▽ MEAN LOW TIDE

TCE TRICHLOROETHENE

1,4–D 1,4–DIOXANE

ND NON–DETECT

NOTE:
ALL SECTIONS ARE LOOKING UPSTREAM
ALL LOCATIONS AND SCALES ARE APPROXIMATE
CONCENTRATIONS ARE IN ug/L
(STREAM SAMPLED SEPT. 2014. WELLS SAMPLED DEC. 2014)

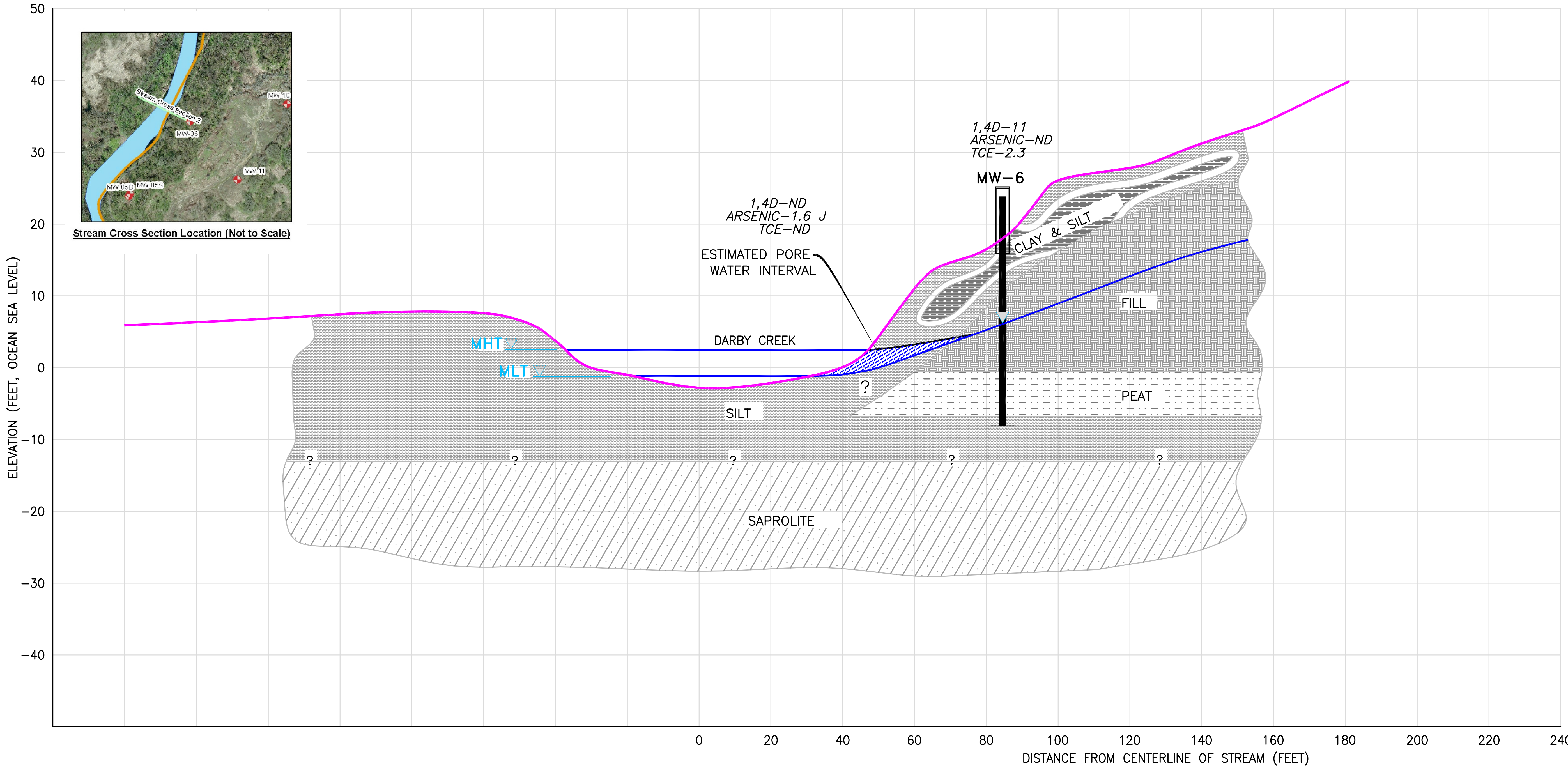
SCALE:
HORIZONTAL 1" = 30'
VERTICAL 1" = 15'

TETRA TECH

STREAM CROSS SECTION 1
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU–3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
LCDA_STREAM_PROFILES.dwg	AS NOTED

FIGURE NUMBER	REV	DATE
FIGURE 4–24	0	11/16/17



LEGEND

MHT ▽	MEAN HIGH TIDE
MLT ▽	MEAN LOW TIDE
TCE	TRICHLOROETHENE
1,4–D	1,4–DIOXANE
ND	NON–DETECT

NOTE:

ALL SECTIONS ARE LOOKING UPSTREAM
ALL LOCATIONS AND SCALES ARE APPROXIMATE
CONCENTRATIONS ARE IN ug/L
(STREAM SAMPLED SEPT, 2014, WELLS SAMPLED DEC. 2014)

SCALE:
HORIZONTAL 1" = 30'
VERTICAL 1" = 15'

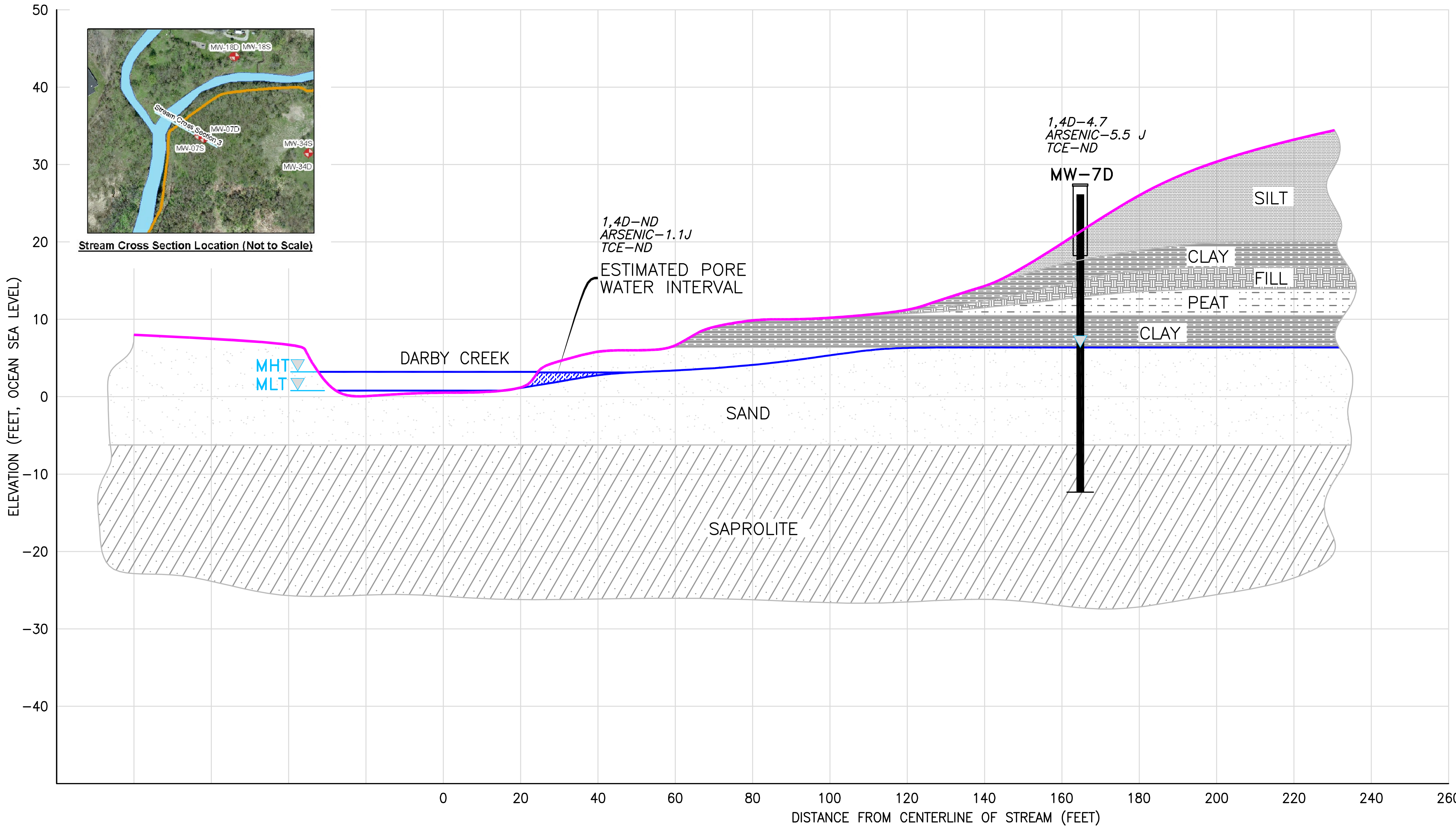
TETRA TECH

STREAM CROSS SECTION 2
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU–3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
LCDA_STREAM_PROFILES.dwg	AS NOTED

FIGURE NUMBER	REV	DATE
FIGURE 4–25	0	11/16/17

C:\03-Projects\Federal\Lower Darby\112G03943 - LDCA OU3 RI_FS - JCK\Documents\RI Report\LCDA_STREAM_PROFILES.dwg MKB 11/16/17



LEGEND

MHT	MEAN HIGH TIDE
MLT	MEAN LOW TIDE
TCE	TRICHLOROETHENE
1,4-D	1,4-DIOXANE
ND	NON-DETECT

NOTE:
ALL SECTIONS ARE LOOKING UPSTREAM
ALL LOCATIONS AND SCALES ARE APPROXIMATE
CONCENTRATIONS ARE IN ug/L
(STREAM SAMPLED SEPT, 2014, WELLS SAMPLED DEC. 2014)

SCALE:
HORIZONTAL 1" = 30'
VERTICAL 1" = 15'

TETRA TECH

STREAM CROSS SECTION 3
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE
LCDA_STREAM_PROFILES.dwg	AS NOTED

FIGURE NUMBER	REV	DATE
FIGURE 4-26	0	11/16/17

	1802-00 9/13/2013	1802-02 9/13/2013
INORGANICS (µg/L)		
ALUMINUM	75.9	20.5
ARSENIC	1.1 J+	0.76 J+
BARIUM	**52.1 J**	**63.1 J**
BORON	**30.7**	**42.8**
CALCIUM	22200	38300
IRON	293	49.6 J
LEAD	**2.6**	**7.6**
MANGANESE	**147**	**138**
MERCURY	ND	**0.047 J**
SELENIUM	0.5 J	0.3 J
SVOCS (µg/L)		
1,4-DIOXANE	ND	ND
PAHS (µg/L)		
ANTHRACENE	ND	**0.021 J**
BENZO(a)ANTHRACENE	0.012 J	0.017 J
FLUORANTHENE	ND	ND
PYRENE	ND	ND
PESTICIDES (µg/L)		
4,4'-DDT	**0.0021 J**	**0.0016 J**
ALPHA-CHLORDANE	**0.0027 J**	0.0016 J
GAMMA-CHLORDANE	0.0021 J	ND
HEPTACHLOR	ND	ND
HEPTACHLOR EPOXIDE	**0.0021**	ND
TOTAL PCBS (pg/L)		
	NS	NS
DIOXIN (pg/L)		
OCDD	NS	NS
TOTAL TEQ FISH	NS	NS

	MW-07D 3/25/2014	MW-07D 12/18/2014
INORGANICS (µg/L)		
ARSENIC	**5.5**	**9.9**
BARIUM	253	373
BORON	2950	3320
CALCIUM	23600	35600
COBALT	**10.2**	**8**
CYANIDE	**3.9 J**	ND
IRON	9210 J	12300
MANGANESE	321	304
VOCS (µg/L)		
1,4-DICHLOROBENZENE	**3.1**	**3.8**
SVOCS (µg/L)		
1,4-DIOXANE	**4.7**	**6.4**
PAHS (µg/L)		
BENZO(A)ANTHRACENE	NS	**0.043 J**
PESTICIDES (µg/L)		
ALDRIN	ND	**0.0022 J**
DELTA-BHC	**0.034 J**	0.00047 J
DIELDRIN	ND	0.00042 J
HEPTACHLOR	ND	0.00079 J
PCBS (µg/L)		
TEQ	0.0031	0.00021
TOTAL PCB CONGENERS	**770000**	**1000000 Z**
DIOXIN (pg/L)		
1,2,3,7,8,9-HXCDD	ND	**1.21 Z**
TEQ	ND	NA
TEQ MAMMAL	NA	0.121
PFAS (µg/L)		
PERFLUOROOCTANOIC ACID	NS	**0.22 J**
PERFLUOROOCTANE SULFONIC ACID	NS	0.13 J

	1601-00 9/11/2013	1601-02 9/11/2013
INORGANICS (µg/L)		
ALUMINUM	18.4 J	26.9
ARSENIC	1.6 J+	3.5 J+
BARIUM	**96.8 J**	**96.2 J**
BORON	**48.1**	**805**
CALCIUM	36800	36200
IRON	**1080**	**2030**
LEAD	1.9	1.4
MANGANESE	**433**	**213**
MERCURY	ND	ND
SELENIUM	0.64 J	**2.6 J**
SVOCS (µg/L)		
1,4-DIOXANE	ND	20
PAHS (µg/L)		
ANTHRACENE	ND	ND
BENZO(a)ANTHRACENE	ND	**0.052 J**
FLUORANTHENE	ND	**0.078 J**
PYRENE	**0.084 J**	**0.095 J**
PESTICIDES (µg/L)		
4,4'-DDT	**0.015 J**	0.0053 J
ALPHA-CHLORDANE	**0.0035 J**	ND
GAMMA-CHLORDANE	**0.0025 J**	0.0041 J
HEPTACHLOR	0.0011 J	0.0036
HEPTACHLOR EPOXIDE	ND	ND
TOTAL PCBS (pg/L)		
	5390	19100
DIOXIN (pg/L)		
OCDD	ND	479
TOTAL TEQ FISH	ND	**0.0479**

	MW-07S 3/25/2014	MW-07S 12/18/2014
INORGANICS (µg/L)		
ARSENIC	**28.7**	**34.7**
BARIUM	266	272
BORON	1770	NS
CALCIUM	37400	40400
COBALT	**11.5**	**6.5**
CYANIDE	**4.3 J**	ND
IRON	**46000 J**	**37200**
MANGANESE	**857**	**757**
SELENIUM	ND	0.87 J
VOCS (µg/L)		
1,4-DICHLOROBENZENE	**1.6**	**2**
SVOCS (µg/L)		
1,4-DIOXANE	**2.3**	**7.8**
PESTICIDES (µg/L)		
ALDRIN	**0.039 J**	0.00051 J
BETA-BHC	**0.03 J**	ND
DELTA-BHC	ND	0.00065 J
DIELDRIN	**0.022 J**	0.0015 J
HEPTACHLOR	ND	0.00064 J
PCBS (pg/L)		
TEQ	0.00	0.00071
TOTAL PCB CONGENERS	**197000**	**300000 Z**
DIOXIN (pg/L)		
1,2,3,4,7,8-HXCDF	ND	0.67 J
TEQ	ND	NA
TEQ MAMMAL	NA	0.067
PFAS (µg/L)		
PERFLUOROOCTANOIC ACID	NS	**0.16 J**
PERFLUOROOCTANE SULFONIC ACID	NS	**0.16 J**

	MW-06 3/11/2014	MW-06 12/18/2014
INORGANICS (µg/L)		
ALUMINUM	ND	29.3
ARSENIC	ND	**2.8**
BARIUM	326	750
BORON	1490	NS
CALCIUM	143000 J	156000
COBALT	**7.5**	**11.3**
CYANIDE	ND	**30.4**
IRON	**15700 J**	**22900**
LEAD	1.8	1.5
MANGANESE	**442 J**	**622**
MERCURY	ND	0.084 J-
SELENIUM	0.38 J	ND
VOCS (µg/L)		
1,4-DICHLOROBENZENE	ND	**1.6**
TRICHLOROETHENE	**2.3 J**	ND
SVOCS (µg/L)		
1,4-DIOXANE	**11**	**92**
PAHS (µg/L)		
BENZO(A)ANTHRACENE	NS	**0.041 J**
PESTICIDES (µg/L)	ND	0.0007 J
ALDRIN	ND	0.0007 J
BETA-BHC	ND	0.001 R
DELTA-BHC	ND	0.00033 J
DIELDRIN	ND	0.0016 J
HEPTACHLOR	ND	**0.01 J**
PCBS (pg/L)		
TEQ	NS	NS
TOTAL PCB CONGENERS	NS	NS
DIOXIN (pg/L)		
1,2,3,4,6,7,8,9-OCDD	190	**547**
TEQ	0.057	NA
TEQ MAMMAL	NA	0.166
PFAS (µg/L)		
PERFLUOROOCTANOIC ACID	NS	**0.28 J**
PERFLUOROOCTANE SULFONIC ACID	NS	**0.17 J**

	MW-04 3/20/2014	MW-04 12/18/2014
INORGANICS (µg/L)		
ALUMINUM	25.9	ND
ARSENIC	ND	1.1
BARIUM	1530	2220
BORON	1430	NS
CALCIUM	137000 J	172000
COBALT	0.78 J	1.4
CYANIDE	ND	ND
IRON	**21200**	**31100**
LEAD	2.9 J	ND
MANGANESE	293	**494**
MERCURY	ND	0.11 J-
VOCS (µg/L)		
1,4-DICHLOROBENZENE	**1.9**	**2.6**
SVOCS (µg/L)		
1,4-DIOXANE	**14**	**16**
PAHS (µg/L)		
BENZO(A)ANTHRACENE	NS	**0.015 J**
PESTICIDES (µg/L)		
ALDRIN	ND	**0.0024 J**
BETA-BHC	ND	0.0024 J
DELTA-BHC	ND	0.0025 J
DIELDRIN	ND	0.00039 J
HEPTACHLOR	ND	**0.0075 J**
PCBS (pg/L)		
TEQ	**0.15**	0.017
TOTAL PCB CONGENERS	**600000**	**400000 Z**
DIOXIN (pg/L)		
1,2,3,4,6,7,8,9-OCDD	**2100**	161
1,2,3,4,6,7,8-HPCDD	**220**	ND
1,2,3,4,7,8-HXCDF	ND	**1.41 J**
1,2,3,6,7,8-HXCDF	ND	0.569 Z
1,2,3,7,8,9-HXCDD	ND	0.491 J
TEQ	**2.8**	NA
TEQ MAMMAL	NA	0.108
PFAS (µg/L)		
PERFLUOROOCTANOIC ACID	NS	**0.55 J**
PERFLUOROOCTANE SULFONIC ACID	NS	**0.96 J**

	0301-00 9/9/2013	0301-02 9/9/2013	0301-02DUP 9/9/2013
INORGANICS (µg/L)			
ALUMINUM	40	**101**	
ARSENIC	**14.7 J+**	**8.1 J+**	**8.4 J+**
BARIUM	**469**	**466**	**453**
BORON	**475**	**952**	**948**
CALCIUM	106000	**127000**	**122000**
IRON	**81500**	**76000**	**72300**
LEAD	**4**	**9.3**	ND
MANGANESE	**3200**	**2360**	**2360**
MERCURY	**0.13 J**	**0.12 J**	**0.099 J**
SVOCS (µg/L)			
1,4-DIOXANE	0.59 J	8.9	9.6
PAHS (µg/L)			
ANTHRACENE	**0.077 J**	**0.098**	**0.11**
BENZO(a)ANTHRACENE	ND	**0.038 J**	ND
FLUORANTHENE	0.037 J	**0.052 J**	**0.04 J**
PYRENE	**0.032 J**	**0.098**	**0.092 J**
PESTICIDES (µg/L)			
HEPTACHLOR	0.001 J	ND	ND
TOTAL PCBS (pg/L)			
	3170	692	NS
DIOXIN (pg/L)			
OCDD	ND	ND	ND
TOTAL TEQ FISH	ND	ND	ND

	MW-03 3/11/2014	MW-03 12/4/2014
INORGANICS (µg/L)		
ARSENIC	**5.1**	**10**
BARIUM	453	1060
BORON	2490	3160 J+
CALCIUM	89200 J	156000
COBALT	**6.5**	ND
CYANIDE	**12.3**	**12.4**
IRON	**44900 J**	**55100**
LEAD	2.8	ND
MANGANESE	**535 J**	**969**
MERCURY	ND	0.044 J
SELENIUM	1.7 J	0.55 J
VOCS (µg/L)		
1,4-DICHLOROBENZENE	ND	0.11 J
SVOCS (µg/L)		
1,4-DIOXANE	**13**	**27**
PESTICIDES (µg/L)		
ALDRIN	ND	**0.001 J**
BETA-BHC	**0.078 J**	0.0007 J
DELTA-BHC	ND	0.0036 J
DIELDRIN	ND	ND
HEPTACHLOR	ND	0.0008 J
PCBS (pg/L)		
TEQ	0.00	0.00015
TOTAL PCB CONGENERS	9900	NA
DIOXIN (pg/L)		
1,2,3,4,7,8-HXCDF	ND	**1.16 Z**
1,2,3,6,7,8-HXCDF	ND	**1.03 Z**
2,3,4,6,7,8-HXCDF	ND	**1.4 J**
2,3,4,6,7,8-HXCDF	ND	**1.01 Z**
TEQ	ND	NA
TEQ MAMMAL	NA	0.552
PFAS (µg/L)		
PERFLUOROOCTANOIC ACID	NS	**0.22**
PERFLUOROOCTANE SULFONIC ACID	NS	**0.11 J**

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURE\GW VS POREWATER.MXD MKB 11/17/2017

LEGEND

- Shallow Monitoring Well
- Pore Water Sample Location (September 2013)
- NA Not Available
- ND Not Detected
- NS Not Sampled
- J Estimated Value
- R Rejected Value

Notes:
1. Highlighted values for monitoring well samples indicate the value exceeds RSLS for Tap Water (June 2017).
2. Bold values for pore water samples indicate the value exceeds EPA Region III Biological Technical Assistance Group (BTAG) Fresh Water Screening Benchmarks (July 2006).

300 150 0 300 600
Feet

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

TETRA TECH

COMPARISON BETWEEN SHALLOW GROUNDWATER AND PORE WATER CONCENTRATIONS
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE	
GW vs Porewater	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 4-27	0	11/17/17

C:\03-PROJECTS\FEDERAL\LOWER DARBY\112G03943 - LDCA OU3 RI_FS - JCK\DOCUMENTS\RI REPORT\FIGURES\STREAM SEGMENTS.MXD MKB 11/17/2017

Legend

- Stream Segments of Concern

Pore Water Sampling Location

- May 2103
- May 2013 and February 2016
- September 2013
- September 2013 and February 2016
- Area of Highest Landfill Elevations
- Historical Extent of Clearview Landfill

300 150 0 300 600

Feet

This map is provided by Tetra Tech solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by Tetra Tech, nor will Tetra Tech be held responsible for any use of this document for purposes other than which it was intended.

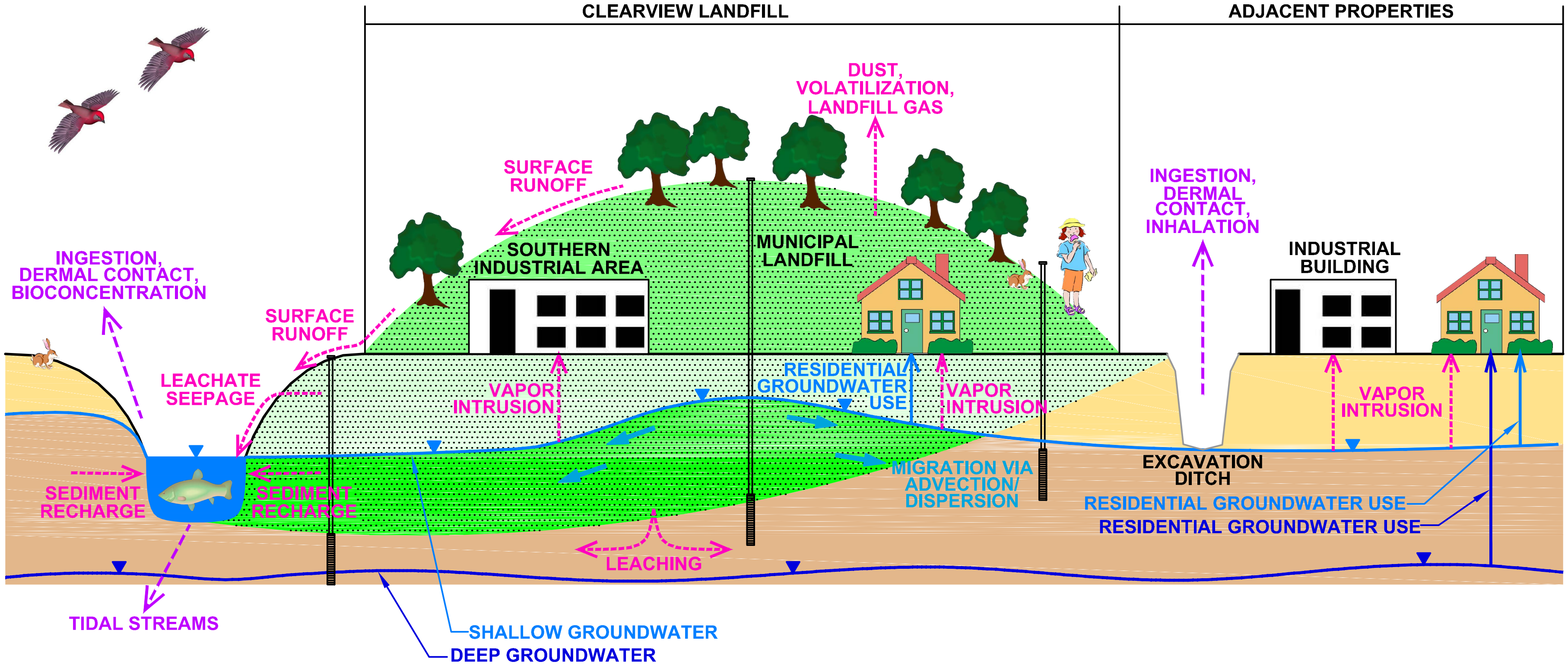
TETRA TECH

STREAM SEGMENTS WITH PORE WATER AND LEACHATE CONCERNS

LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

FILE	SCALE	
Stream Segments	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
FIGURE 4-28	0	11/17/17

C:\All_Projects\112G01067\1210\112G01067GCSM01.dwg MKB 6/21/18



LEGEND

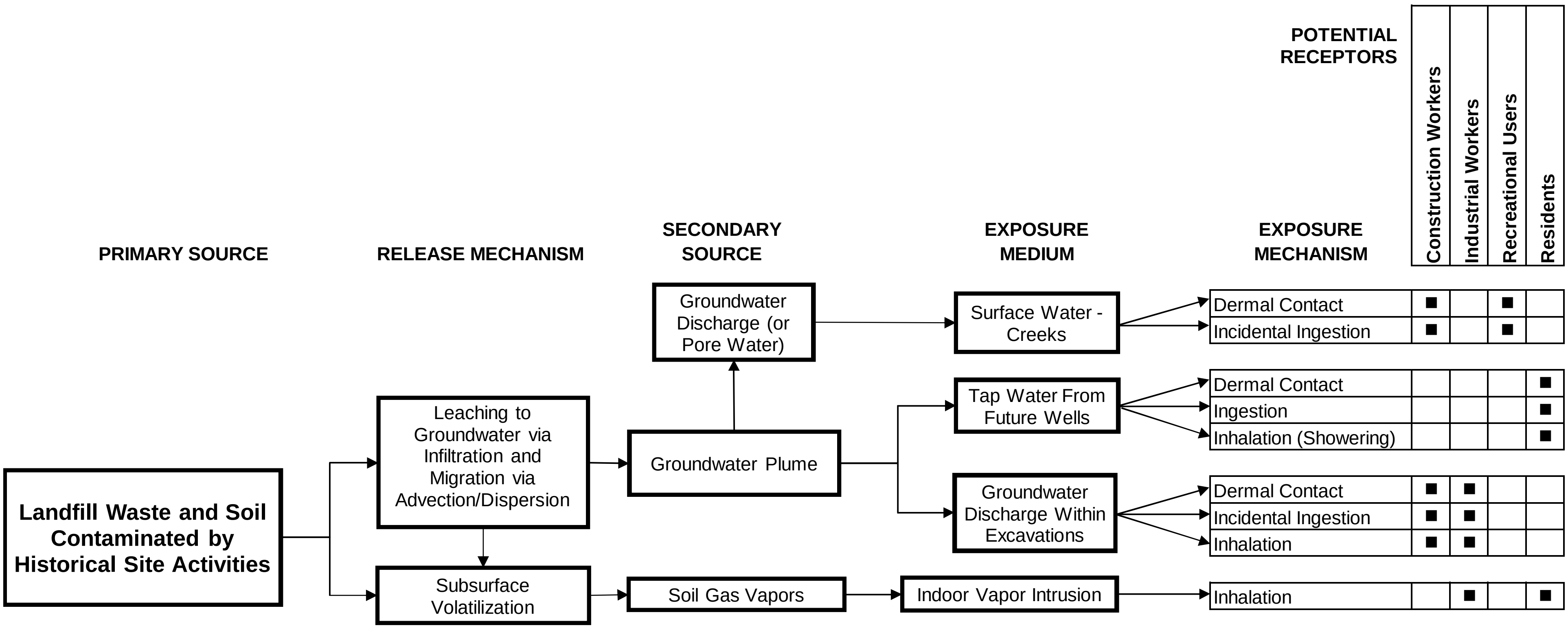
- SHALLOW GROUNDWATER LEVEL
- DEEP GROUNDWATER LEVEL
- GROUNDWATER FLOW DIRECTION
- RELEASE MECHANISM
- EXPOSURE ROUTE
- LANDFILL CONTENTS ABOVE LOCAL SURFACE ELEVATION
- LANDFILL CONTENTS BELOW LOCAL SURFACE ELEVATION
- LANDFILL CONTENTS BELOW LOCAL GROUNDWATER LEVEL

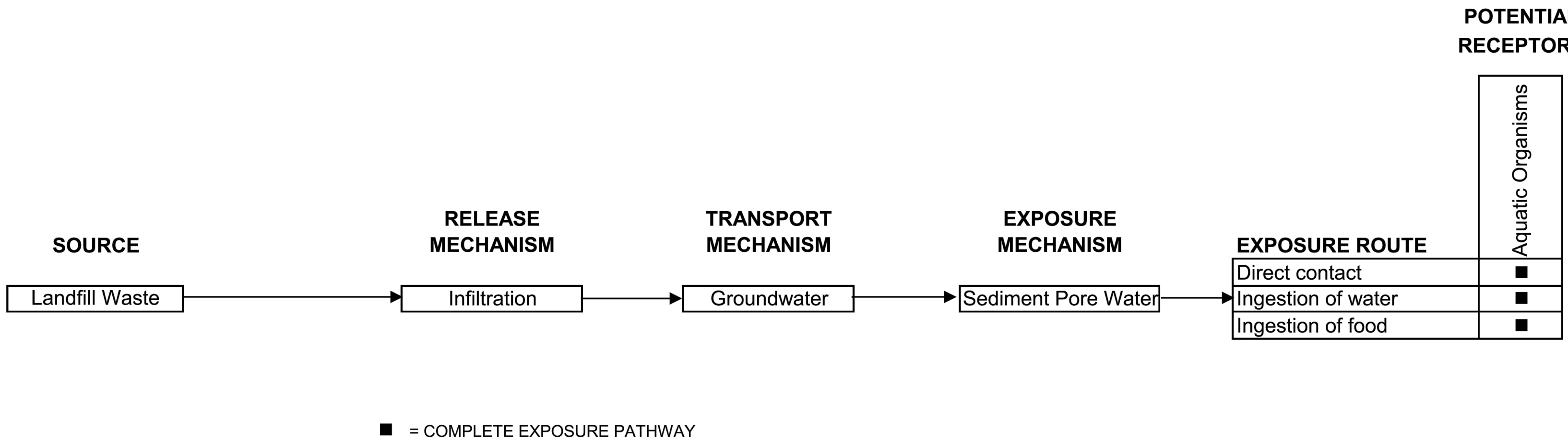
TETRA TECH

CONCEPTUAL SITE MODEL
LOWER DARBY CREEK AREA (LDCA) SITE
OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	112G01067GCSM01
REV 0	DATE 6/21/18
FIGURE NUMBER	FIGURE 6-1

FIGURE 6-2
CONCEPTUAL SITE MODEL FOR HUMAN HEALTH RISK EXPOSURE PATHWAYS
LOWER DARBY CREEK AREA RI/FS





This Conceptual Site Model only shows the pathways that are being evaluated for the Screening Level Ecological Risk Assessment

TETRA TECH

CONCEPTUAL SITE MODEL FOR
ECOLOGICAL RISK EXPOSURE PATHWAYS
LOWER DARBY CREEK AREA (LDCA)
SITE OPERABLE UNIT 3 (OU-3)
PHILADELPHIA AND DELAWARE COUNTIES, PENNSYLVANIA

SCALE	AS NOTED
FILE	DECISION LOGIC DIAGRAMS
REV	0
DATE	3/7/17
FIGURE NUMBER	**FIGURE 6-3**